Protection of the Marine Environment: The International and National Regulation of Deep Seabed Mining Activities

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Abstract This chapter provides an overview of the international and national regulatory framework pertaining to deep seabed mining activities. It begins by discussing the UN Convention on the Law of the Sea, the backdrop for all marine activities – be they national or international – and examines the obligations of states to protect the marine environment from the harmful effects arising from deep seabed mining. Next, the chapter examines the international regime for deep seabed mining (i.e. "activities in the Area"), explaining the "common heritage of mankind" status of the Area (i.e. the international seabed); the functions of the International Seabed Authority (ISA), the international organization established to govern deep seabed mining in the Area; and the concept of state sponsorship of non-state entities (i.e. private actors) for deep seabed mining in the Area. The chapter follows with a discussion of the development of national legislation to regulate deep seabed mining, examining efforts in the Pacific region where many prospective deep-sea mining sites are located. This includes a look at the legislative regimes of several Pacific Island nations, namely, Papua New Guinea, Tonga and the Cook Islands, for whom deep seabed mining may soon become a reality – as well as New Zealand and Japan, countries with comparatively developed rule of law and legislative regimes that have undertaken or considered deep seabed mining in their national waters. Overall, the chapter critically describes and evaluates the current regulatory status in the international and national seabed areas and highlights some salient gaps that require urgent attention in order to ensure marine environmental protection and mitigate impacts on humans.

Keywords Deep-sea mining · Marine environment · National, international regulations

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1 Introduction

Despite resounding scientific evidence that seabed mining could cause significant, adverse harm to the marine environment and resulting impacts on people, commercial interest in harvesting these mineral resources continues to grow. In order to counteract the undesired consequences of this activity, it is necessary to design a robust and precautionary legal framework, both in areas within and beyond national jurisdiction. Although there are different rules, authorities and regimes assigned to these two ocean spaces, ensuring similar levels of environmental protection in both is critical. The seas, its inhabitants and its ecosystems do not recognize the boundary lines and zones as demarcated by nations (Tanaka 2015). Furthermore, the multitude of environmental stressors constantly foisted on the oceans and their impacts are felt all across the ocean space, not just locally (Halpern et al. 2015).

It is becoming increasingly clear that deep seabed mining will impair the natural function of the deep ocean in climate regulation, while also severely impacting the integrity of the seabed and its rich biodiversity (Wedding et al. 2015; Van Dover et al. 2017), leading to potentially dire consequences for coastal communities and humans in general. The conduct of such activity is therefore a matter of common concern to humankind (Hunter et al. 2018), in which another related norm – the "polluter-pays principle", requiring the entity responsible for environmental harm to pay for the damage (Beder 2006) – should be construed concurrently. While the international community is currently taking steps to develop comprehensive regulations pertaining to mineral mining in areas beyond national jurisdiction – including measures to protect the marine environment – the regulation of exploitation of natural resources in areas within national jurisdiction has been left to individual coastal states entirely without any predetermined stipulations (Markus and Singh 2016). This is a matter of concern as the first large-scale commercial deep seabed mining effort in areas within national jurisdiction – specifically the territorial waters of Papua New Guinea – appears likely to commence in 2019 (Miller et al. 2018).

Centred on the protection of the marine environment, this chapter will explore the international and national regulation of deep seabed mining activities. We will begin by introducing and discussing the international obligation to protect the marine environment in both areas beyond national jurisdiction and areas within national jurisdiction. Through this analysis, the zonal practice in the law of the sea, in which separate regimes co-exist and operate within predetermined mandates, will become apparent. Next, we will examine the international deep seabed mining regime for areas beyond national jurisdiction. In this context, we will introduce the International Seabed Authority (ISA), the international organization designated to govern the mineral resources of the international seabed and the regulatory framework that surrounds it. Following that, we will turn our attention to deep seabed mining activities within national jurisdiction. Here, we will inspect the deep seabed mining regulatory approach within the domestic legal setting of several Pacific Island countries (Papua New Guinea, Tonga and the Cook Islands) as well as that of New Zealand and Japan. These countries have been selected based on a high

possibility of large-scale commercial mining taking place within their jurisdiction in the near future, as well as past engagement with seabed mining actors. Finally, while the chief purpose of this chapter is to provide a descriptive overview of the two deep seabed mining regimes, we will nevertheless end by identifying some gaps that exist between the two regimes based on the current state of affairs and offer a suggestion to bridge them.

2 The Obligation to Protect the Marine Environment and the Regulation of Deep Seabed Mining Activities

The UN Convention on the Law of the Sea 1982 (UNCLOS) is the starting point for all discourses pertaining to the modern law of the sea. It provides a general legal framework with an overarching aim of harmonizing domestic and global uses of the oceans as well as balancing competing uses of the marine environment, while simultaneously striving to protect and preserve the marine environment. As a legally binding instrument under international law with widespread acceptance, UNCLOS functions to regulate how states (and by extension, entities subject to their sovereignty or control) carry out activities in marine spaces both within and beyond their jurisdiction. In terms of state action and the protection of the marine environment, Harrison (2017) eloquently explains how UNCLOS serves as the foundational basis for, inter alia, jurisdictional mandate, general principles, substantive rules and procedural rules vis-à-vis human endeavours at sea and the protection of the marine environment. Thus, UNCLOS stipulates which states (or international organizations, as the case may be) are seized with jurisdiction to take measures to protect the marine environment; the general principles which expound the responsibility or obligation to do so; descriptive rules of what is expected of them in performing their responsibilities or obligations; and the procedural steps that must be taken in order to fulfil the same.

UNCLOS declares that all "problems of ocean space are closely interrelated and need to be considered as a whole" (UNCLOS Preamble). As seabed mining is slated to join the multitude of activities carried out in the ocean space, it is essential to ensure that it is properly regulated and subjected to good management practices, irrespective of where it is carried out (Verlaan 2018). However, the designation by UNCLOS of separate jurisdictional mandates for different ocean spaces (i.e. maritime areas or zones) creates a situation where a specific activity like deep seabed mining may be subject to wholly disparate and incoherent rules and standards from one zone to another. This poses a significant problem because lenient, compromising measures adopted in one zone will nullify stringent, ironclad measures adopted in the other, not least due to the risk of transboundary harm and aggregate ocean impact from the intended activity. Further, activities carried out in different areas within national jurisdiction also stand to be subject to various national legislations in their respective territories that are not necessarily harmonized with each other.

This section will consider the jurisdictional mandate in relation to deep seabed mining activities, as well as the ensuing obligation to protect the marine environment.

2.1 Jurisdictional Mandate

UNCLOS creates several maritime zones, namely, internal waters, territorial sea, contiguous zone, exclusive economic zone, continental shelf, high seas and the international seabed (i.e. "the Area"), each of which is associated with different forms of prescriptive and enforcement jurisdictions (Churchill and Lowe 1999; Harrison 2011; Tanaka 2015; Rothwell and Stephens 2016; Kaye 2016). A coastal state's sovereignty extends beyond its land territories and internal waters up to a maritime zone defined as the territorial sea (up to 12 nautical miles from its baselines).[1] In the exclusive economic zone or EEZ (declared up to 200 nautical miles from its baselines) and continental shelf (extending up to 350 nautical miles or even more from its baselines)[2], a coastal state possesses sovereign rights to exploit living and nonliving natural resources within those areas. The high seas is specifically referred to as the maritime area beyond the exclusive economic zone,[3] whereas the international seabed (or "the Area") covers the area of the seabed that is not subject to national jurisdiction (i.e. beyond the continental shelf of coastal states). In relation to mineral mining on the seafloor, the zonal approach under UNCLOS gives rise to two separate seabed regimes: areas beyond national jurisdiction (the Area) and areas within national jurisdiction (chiefly, the continental shelf).

In terms of the jurisdictional framework for the international seabed, Article 1(1) of UNCLOS provides the following definition: "the 'Area' means the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction". In other words, the Area begins where national claims to the continental shelf end. Presently, the exact extent of the Area has not been finalized due to the fact that national claims for extended continental shelves have yet to be determined with finality (Franckx 2010). However, there is a general understanding pertaining to the rough estimate of the Area (Chircop 2011). A whole chapter and annex of UNCLOS (namely, Part XI

[1] The contiguous zone is a maritime area contiguous to the territorial sea, in which a coastal state may exercise a number of sovereign acts in matters pertaining to its domestic customs, fiscal, immigration and sanitary laws.

[2] As opposed to the exclusive economic zone, which must be declared, sovereign rights over the continental shelf exist as of right for up to 200 nautical miles since it is seen as an extension of land (Kaye 2016: 11). Rules of delimitation apply if there are overlapping claims from neighboring states, and as such a coastal state's continental shelf may be less than 200 nautical miles. A coastal state may, under certain conditions pursuant to Article 76 of UNCLOS, extend its continental shelf zone for up to 350 nautical miles from its baselines.

[3] It should be noted, however, that certain freedoms enjoyed at the high seas (beyond the rights to exploit natural resources and several others) may also be enjoyed within exclusive economic zones, such as navigation, overflight and the laying of submarine cables (see UNCLOS, Articles 58 and 86).

and Annex III) as well as the 1994 Agreement relating to the Implementation of Part XI of UNCLOS are dedicated to the Area and its resources. Article 134(2) proclaims that Part XI governs the conduct of "activities in the Area", which is defined under Article 1(3) as "all activities of exploration for, and exploitation of, the resources of the Area". The use of the term "resources" in this context is further clarified as "all solid, liquid or gaseous mineral resources in situ in the Area at or beneath the seabed, including polymetallic nodules". Hence, it is clear that living resources do not fall within the ambit of Part XI. Accordingly, the existing legal framework for the Area is synonymous with the international seabed mining regime. Article 137(1) of UNCLOS firmly states that "no State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources" and goes on in Article 137(2) to assert that "all rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act". As explained in Article 1(2) of UNCLOS, the "Authority" here refers to the International Seabed Authority (ISA). Accordingly, the ISA possesses the mandate to exercise jurisdiction over activities in the Area.

As for the national seabed area (i.e. the continental shelf), coastal states clearly possess the requisite mandate over mineral resources. Article 77(1) of UNCLOS prescribes that the "coastal State exercises over the continental shelf sovereign rights for the purpose of exploring it and exploiting its natural resources" and in Article 77(4) qualifies "natural resources [… to] consist of the mineral and other non-living resources of the seabed […]". This is also the case when a coastal state extends its outer continental shelf as permitted by Article 76; however, the coastal state is required to make payments or contributions in kind to the ISA for all mineral exploitations beyond 200 nautical miles in those instances. Accordingly, the coastal state is clearly seized with jurisdictional mandate over mineral exploitation in its delineated (or delimited, as the case may be) continental shelf.

The following sub-sections will discuss and compare the two separate regimes in the context of the protection of the marine environment. As will be seen, jurisdictional mandate over resources also connotes the obligation to protect the marine environment in the area concerned.

2.2 Obligation to Protect the Marine Environment

Starting with the international seabed, Article 145 of UNCLOS is instructive on the general obligation to protect the marine environment from the harmful effects arising from the conduct of activities in the Area. It stipulates the following:

> Article 145: Protection of the marine environment
>
> Necessary measures shall be taken in accordance with this Convention with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects which may arise from such activities. To this end the Authority shall adopt appropriate rules, regulations and procedures for inter alia:

(a) the prevention, reduction and control of pollution and other hazards to the marine environment, including the coastline, and of interference with the ecological balance of the marine environment, particular attention being paid to the need for protection from harmful effects of such activities as drilling, dredging, excavation, disposal of waste, construction and operation or maintenance of installations, pipelines and other devices related to such activities;
(b) the protection and conservation of the natural resources of the Area and the prevention of damage to the flora and fauna of the marine environment.

Article 17(2)(f) of Annex III to UNCLOS goes further and prescribes that "rules, regulations and procedures shall be drawn up in order to secure effective protection of the marine environment from harmful effects directly resulting from activities in the Area or from shipboard processing immediately above a mine site of minerals derived from that mine site, taking into account the extent to which such harmful effects may directly result from drilling, dredging, coring and excavation and from disposal, dumping and discharge into the marine environment of sediment, wastes or other effluents".

Premised on these two key provisions, it is obvious that the ISA has the obligation to take necessary measures, including the adoption of rules and regulations, to protect the marine environment from the harmful effects arising from the conduct of mineral exploitation. This clearly includes coverage of not just the physical seabed but also the ocean surface (particularly from shipboard processing and the discharge of waste) and the water column above the mine site (especially plume and sediment dispersal).

Further to that, Article 209(1) reaffirms that "international rules, regulations and procedures shall be established in accordance with Part XI to prevent, reduce and control pollution of the marine environment from activities in the Area. Such rules, regulations and procedures shall be re-examined from time to time as necessary". It goes on further, in Article 209(2), to require states to "adopt laws and regulations to prevent, reduce and control pollution of the marine environment from activities in the Area undertaken by vessels, installations, structures and other devices flying their flag or of their registry or operating under their authority, as the case may be. The requirements of such laws and regulations shall be no less effective than the international rules, regulations and procedures referred to in paragraph 1".

The 2011 Advisory Opinion on the Responsibilities and Obligations of States Sponsoring Persons and Entities with respect to Activities in the Area by the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea (Advisory Opinion 2011) sheds further light into this topic. The Seabed Disputes Chamber opined that sponsoring states (i.e. states that back private entities to conduct activities in the Area) must meet certain direct and due diligence obligations pertaining to marine environmental protection. This includes adhering to the precautionary principle, ensuring the carrying out of proper environmental impact assessments and the continuous monitoring of mining activities and its environmental impacts during and after its conclusion, facilitating the adoption of best environmental practices in conducting mining activities and assisting the ISA in carrying out its functions.

With respect to seabed mining in areas within national jurisdiction, reference to the exclusive economic zone regime is necessary. In particular, Article 56 of UNCLOS stipulates the following:

> Article 56: Rights, jurisdiction and duties of the coastal State in the exclusive economic zone
>
> 1. In the exclusive economic zone, the coastal State has:
>
> (a) sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds;
>
> (b) jurisdiction as provided for in the relevant provisions of this Convention with regard to:
>
> (i) the establishment and use of artificial islands, installations and structures;
> (ii) marine scientific research;
> (iii) the protection and preservation of the marine environment;
>
> (c) other rights and duties provided for in this Convention.
>
> 2. In exercising its rights and performing its duties under this Convention in the exclusive economic zone, the coastal State shall have due regard to the rights and duties of other States and shall act in a manner compatible with the provisions of this Convention.
> 3. The rights set out in this article with respect to the seabed and subsoil shall be exercised in accordance with Part VI.

Thus, Article 56 clearly confers jurisdiction on the coastal state to conserve and protect the marine environment. This is not limited only to the physical seabed (i.e. continental shelf) but also to the surface ocean and water column (i.e. exclusive economic zone). Further to that, Part XII of UNCLOS, in particular Articles 192 and 193, is pertinent. Article 192 lays down the general obligation of states to "protect and preserve the marine environment". Article 193 asserts that states have the "sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment". This includes, as stipulated under Article 194(3)(c), taking measures to minimize "pollution from installations and devices used in exploration or exploitation of the natural resources of the seabed".

Akin to the position under the international seabed regime, coastal states are also required pursuant to Article 204 of UNCLOS to continuously monitor the environmental harm of activities that they permit and under Article 206 to ensure that environmental impact assessments are carried out prior to the conduct of seabed mining activities. Finally, reference to Article 208, which deals with "pollution from seabed activities subject to national jurisdiction", is essential. Articles 208(1) and (2) provide that coastal states "shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment arising from or in connection with seabed activities subject to their jurisdiction" and "shall take other measures as may be necessary to prevent, reduce and control such pollution", respectively. Article 208(3) goes on to stipulate that "such laws, regulations and measures shall be no less effective than international rules, standards and recommended practices and procedures", while Article 208(4) specifies that states shall "endeavour to harmo-

nize their policies in this connection at the appropriate regional level". Additionally, Article 208(5) instructs that "states, acting especially through competent international organizations or diplomatic conference, shall establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control pollution of the marine environment referred to in paragraph l. Such rules, standards and recommended practices and procedures shall be re-examined from time to time as necessary".

As will be seen later on in the section dedicated to the national framework of deep seabed mining, the requirements imposed by Articles 208(3), (4) and especially (5) have not been satisfactorily met, thereby resulting in a concern arising from the uncertainty of the conditions in which domestic seabed mining activities will take place.

The following section will discuss the international framework for deep seabed mining in the Area, which is rapidly developing due largely to intensified regulatory efforts and discussions at the ISA.

3 The International Regulation of Deep Seabed Mining Activities

This section attempts to clarify the existing framework pertaining to deep seabed mining in the Area and present a comprehensive overview of the international regulation of deep seabed mining activities. First, it will look at some fundamental features pertaining to the Area, including its "common heritage of mankind" status. Second, it will explore the institutional setting pertaining to activities in the Area and introduce the principal actors involved in it. Third, it will briefly examine the regulatory framework surrounding deep seabed mining activities. Finally, this section will provide an outlook of the activities in the Area in light of other competing uses in the Area.

3.1 The Area and Its Salient Features

Central to the discourse of deep seabed mining in the international seabed is Article 136 of UNCLOS, which declares that the Area and its mineral resources are the common heritage of mankind. The significance of this provision is further reflected through Article 311(6), whereby state parties have agreed that there shall be no derogation from the basic principle of the common heritage of mankind. At its very core, the common heritage of mankind principle affirms the following:

1. There shall be no exercise of sovereignty in the Area (Article 137(1)).
2. Resources of the Area are vested in mankind as a whole and shall be managed solely through the ISA (Article 137(2)).

3. Activities in the area shall be carried out for the benefit of mankind (Article 140(1)).
4. The Area shall be used only for peaceful purposes (Article 141).

Furthermore, as seen earlier from Article 145, the principle also entails the effective protection of the marine environment from harmful effects arising from activities in the Area. Alongside the protection of the marine environment, the common heritage of mankind principle further integrates the concepts of intergenerational equity and sustainable development into the international seabed mining discourse (Jaeckel et al. 2017). As such, the need to preserve the marine environment and to conserve mineral resources for future generations is an integral pillar of the common heritage of mankind. Another implication of the common heritage of mankind principle is the benefit sharing regime. Article 140(2) requires the Authority to provide for the "equitable sharing of financial and other economic benefits derived from activities in the Area through any appropriate mechanism, on a non-discriminatory basis". The equitable dimension in the distribution of benefits arising from such activities is a critical element to the common heritage of mankind principle because the mineral resources of the seabed are non-renewable and will deplete on exploitation (Lodge et al. 2017). Thus, the ISA is essentially tasked to develop the resources of the Area, manage it in a rational and orderly manner and adopt measures to optimize revenues and increase the availability of minerals on the one hand (Article 150 of UNCLOS, Article 13 of Annex III to UNCLOS, 1994 Implementation Agreement) - and to protect the marine environment from the consequential harmful effects, conserve resources for future generations and equitably distribute benefits, on the other. This provides the suitable backdrop for the subsequent analysis on the institutional setting pertaining to activities in the Area.

3.2 Institutional Setting

As can be gleaned from the above, the ISA is the sole body responsible for the governance of the deep seabed mineral resources in the Area (Lodge 2012). Article 139(1) of UNCLOS distinctly provides that only the ISA may permit states or their sponsored entities to conduct activities in the Area. In order to commence exploration or exploitation of mineral resources in the Area, the said interested parties would first need to submit a plan of work for approval and subsequently enter into a contractual relationship with the ISA. In this regard, Article 153(3) is relevant, stating that "activities in the Area shall be carried out in accordance with a formal written plan of work drawn up in accordance with Annex III and approved by the Council after review by the Legal and Technical Commission. In the case of activities in the Area carried out as authorized by the Authority by the entities specified in paragraph 2(b), the plan of work shall, in accordance with Annex III, article 3, be in the form of a contract". At present, a significant majority of exploration contracts involve the ISA and sponsored entities (as opposed to states).

As a starting point, it is useful to mention that private entities may not engage in any form of activity in the Area without a certificate of sponsorship from a sponsoring state. A state, conversely, may engage in activities directly through a contract with the ISA if it so chooses. The rationale behind this is obvious: private contractors are typically not considered subjects of international law (Advisory Opinion 2011).[4] Hence, while a contractual relationship between the ISA and private contractors is necessary for there to be an enforceable recourse under the domestic laws of the sponsoring state, the sponsoring state, a subject of international law, remains responsible for violations (or wrongful acts) under international law (Advisory Opinion 2011). It is critical to note that although there shall be no exercise of sovereignty in the Area, the concept of state sponsorship is an act of sovereignty. A state that chooses to sponsor an entity will incur significant legal responsibilities under international law (Geddis 2017). In this context, a state has the autonomy to decide whether it wishes to sponsor an entity or not. With respect to the prerequisite condition for sponsorship, Article 153(2)(b) of UNCLOS requires that such private entities either possess the nationality of the state in concern or are effectively controlled by the state or their nationals (Advisory Opinion 2011).

It will be recalled that Article 209(2) requires states to enact domestic "laws and regulations to prevent, reduce and control pollution of the marine environment from activities in the Area undertaken by vessels, installations, structures and other devices flying their flag or of their registry or operating under their authority, as the case may be". This includes providing recourse for damages arising from a contractual breach as well as enforcement procedures (Advisory Opinion 2011). Failure to address these matters in an adequate manner may be viewed as a violation of international law. As observed in the 2011 Advisory Opinion, it is incumbent on sponsoring states to enact such national laws in order to give effect to Part XI of UNCLOS. A number of countries (both developed and developing) with an interest in deep seabed mining in the Area, such as Germany, the United Kingdom, China and Singapore, have already done this (Geddis 2017; Jin and Zhang 2017; Egede 2018; Sun 2018).

Another key topic that deserves closer examination is the institutional structure of the ISA. In order to understand the theme of the proceeding sub-section (i.e. the regulatory framework of international deep seabed mining or "DSM"), it is essential to comprehend the operation of the ISA. Several basic points surround this premise. First, Article 156(2) declares that all state parties to UNCLOS are automatically part of the ISA. Second, as provided for in Article 157(1), the ISA, in the form of an international organization, is the vessel for state parties "to organize and control activities in the Area, particularly with a view to administering the resources of the Area". Third, pursuant to Articles 158(1) and (2), there are three principal organs of the ISA, namely, the Assembly, the Council and the Secretariat, and a yet-to-be-established independent organ called the Enterprise.[5] Fourth, Article 159(1)

[4] However, it is acknowledged that there is a growing trend to recognize the role of non-state actors in the realm of international law, especially pertaining to human rights.

[5] Although UNCLOS foresees the establishment of the Enterprise as the independent arm of the

stipulates that all state parties are equal members of the Assembly, which is further determined as the supreme organ of the ISA under Article 160(1). Fifth, in accordance with Article 15 of Section III of the 1994 Implementation Agreement, the Council consists of 36 members of the ISA that are elected by the Assembly. With reference to Article 162(1), the Council, as the executive organ of the ISA, is essentially the decision-making branch of the ISA. Sixth, despite its elevated position, the Council "does not act alone in formulating environmental regulations for the Area"; in this regard, the Legal and Technical Commission, a subsidiary organ to the Council, has "particular responsibility for the protection of the marine environment" (Lodge et al. 2014). Seventh and finally, the Secretariat is responsible for the day-to-day operation of the ISA. While central to the routine administration and functional operation of the ISA, it is useful to recall that the member states – not the Secretariat – are principally and collectively responsible for the management of deep seabed resources. The following sub-section will discuss the regulatory framework for international seabed mining.

3.3 Regulatory Framework

In essence, the regulatory framework for DSM activities in the Area emanates quintessentially from the rule-making feature of the ISA, as discussed above in section 3.2. As mentioned, the ISA is obligated to protect the marine environment from the harmful effects of activities in the Area. To this end, Articles 145 and 209 require the ISA to take necessary measures through the adoption of rules and regulations. Thus, UNCLOS simply lays down the jurisdiction mandate (see Sect. 2.1 above) and provides the general framework for the protection of the marine environment (see Sect. 2.2 above), leaving it to the ISA to develop its own specific set of rules and regulations to precisely govern activities in the Area. This is a unique feature of international law, whereby an organization is assigned full power to create regulations that automatically bind member states with no possibility of opting-out beforehand (Harrison 2011; Jaeckel 2017). However, this can be reconciled with the fact that the Assembly, the supreme organ of the ISA in which all member states are represented, participates in the rule-making function of the ISA at the top of the order (as explained above in Sect. 3.2). This practice enables rule-making to be carried out in a fairly prompt fashion and allows for periodical revision without having to convene a diplomatic conference to amend or modify the parent treaty (Boyle and Chinkin 2007).

The exercise of this rule-making function will eventually result in the collation of a comprehensive dossier known as the "Mining Code", effectively "covering all aspects of mining activities – including prospecting, exploration and exploitation –

ISA, particularly responsible to carry out seabed mining activities on behalf of mankind, the 1994 Implementation Agreement has effectively put this on hold.

and subjecting each of them to specific environmental requirements" (Markus and Singh 2016). To date, three separate sets of regulations covering the exploration of polymetallic nodules, polymetallic sulphides and cobalt-rich crusts, respectively, have been issued alongside numerous guidelines, while a combined set of exploitation regulations encompassing all forms of minerals is currently in the final draft stages. This includes specific regulations for the environment as well as model contractual terms. Given constant developments and the advanced draft stage of the exploitation regulations, an in-depth analysis therein is beyond the scope of this chapter; however, an overview of the current work-in-progress can be found elsewhere (Brown 2018). As the bulk of deep seabed mining activities will involve private entities, the regulations and contractual terms will play a critical function, forming the foundational basis for these actors' obligations and responsibilities, consequently enforceable pursuant to domestic law.

3.4 The International Regulation of Deep Seabed Mining from the Environmental Protection Perspective: An Outlook

As a starting point for this overview analysis, it is necessary to acknowledge the general framework for the protection of the marine environment from the harmful effects of activities in the Area under UNCLOS. In this regard, UNCLOS permits the ISA to design a suitable regulatory regime that balances the development of ocean mineral resources on the one hand and the protection of the marine environment on the other. While benign effort is being exerted towards addressing the potential harmful effects of such activities, certain gaps do appear. For instance, apart from the apparent harm to the seabed and its immediate vicinity, other types of potential harm to the marine environment such as shipboard processing of the recovered minerals and the discharge of incidental wastes appear to have been sidelined. Similarly, the onshore processing of minerals obtained from the international seabed, even though beyond the jurisdiction of the ISA, is largely ignored from the current discourse (Markus and Singh 2016). Both these aspects are related concerns as they should be taken into account in determining whether mining the international seabed is feasible and sustainable to begin with. Apart from that, lacklustre knowledge generation attitudes and the absence of a unit dedicated solely to environmental matters (Jaeckel et al. 2017) are an impediment that could easily be resolved. The suitability of using incentives to advance and encourage the adoption of environmentally sound technologies should also be examined (Lodge et al. 2017). Additionally, introducing more intermediate steps between the initial application for approval of a plan of work and the ultimate decision would further support the protection of the marine environment. For instance, the carrying out of a proper pilot mining test and a comprehensive feasibility study indicating positive, net benefit outcomes should be made a prerequisite to approval (Christiansen et al. 2018).

Another critical point to note is that the jurisdiction of the ISA, including its environmental mandate, is restricted to activities in the Area. As such, the ISA does not, strictly speaking, possess the general mandate to protect the international seabed from non-mining activities. In fact, Article 145 of UNCLOS clearly states that "necessary measures shall be taken […] with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects which may arise from such activities". Apart from that, Article 147(1) stipulates that activities in the Area must accommodate other uses of the Area, such as navigation, the conduct of marine scientific research and the laying of submarine cables. In this regard, there is clear overlap between the ISA's jurisdiction over the conduct of activities in the Area and the mandate exercised by other international organizations. For instance, while shipboard processing of minerals immediately above the mining site falls within the jurisdiction of the ISA, the discharge of waste from ships and dumping at sea generally fall under the purview of the International Maritime Organization (IMO). Specifically, the IMO has the mandate to administer the International Convention for the Prevention of Pollution from Ships 1973/78 (MARPOL) and its six annexes, as well as to oversee the implementation of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972/1996 (London Convention/London Protocol or LC/LP). Thus, there are still some grey areas with respect to power to regulate and enforce regulations particularly beyond the immediate mining site in the Area, i.e. related conduct in the high seas (Verlaan 2018). Moreover, the transportation and onshore processing of these minerals, a subject matter of significant environmental concern, is beyond the ISA's scope of regulatory control and is, respectively, deferred to international shipping rules, in the case of transportation, and domestic legislation, in the case of onshore processing (Markus and Singh 2016).

Furthermore, growing interest in marine genetic resources of the Area and the imminent possibility of a new instrument to govern living resources may also present a new challenge for the governance of activities in the Area. Likewise, emerging scientific developments pertaining to the function of the deep ocean in climate regulation and the ecosystem services provided by its biogeochemical components should feature more widely in the decision-making processes at the ISA. Increased cooperation in an area in which governance is widely fragmented and diverse proves to be the indispensable ingredient to further the protection of the marine environment with respect to the Area (Singh and Jaeckel 2018). In this regard, it is encouraging to note that the ISA has in fact signed several agreements of cooperation or memoranda of understanding with the International Maritime Organization (IMO), the Intergovernmental Oceanographic Commission (IOC) and the International Cable Protection Committee (ICPC).[6] The extent of the effectiveness of such instruments in practice, however, has yet to be thoroughly studied.

[6] See website of the ISA, in particular: https://www.isa.org.jm/files/documents/EN/Regs/IMO.pdf; https://www.isa.org.jm/sites/default/files/documents/EN/Regs/ISA-IOC-MOU.pdf; and https://www.isa.org.jm/sites/default/files/documents/EN/Regs/MOU-ICPC.pdf.

Be that as it may, it is evident that interest in ocean mineral resources is not only confined to the Area. As mentioned earlier, early large-scale commercial mining of the seabed is anticipated to take place in areas within national jurisdiction. This reality necessitates the examination of the national regulation of deep seabed mining activities from the marine environmental protection perspective.

4 National Regulation of Deep Seabed Mining Activities

This section examines national regulatory regimes as they currently exist for deep sea mining in areas of national jurisdiction (typically within the EEZs of coastal states). Although much of the DSM discourse has focused on mining in the Area, many countries also possess significant seabed mineral resources within their own EEZs and have started to move forward with plans to mine their seabed. Pacific Island nations, Japan, New Zealand, Australia, Mexico and Namibia are some of the countries known to be exploring or pursuing various forms of seabed mining within their national waters. Some of these jurisdictions lack discrete seabed mining legislation, relying instead on existing land-based mineral regimes to govern seabed resources. Others have new legislation designed specifically to address DSM.

The following discussion provides a summary overview of the regulatory frameworks of several Pacific Island nations where national DSM is likely, including Tonga, the Cook Islands and Papua New Guinea (where the world's first deep-sea commercial mine is slated to begin production between 2019 and 2020) – as well as a brief look at the regulatory regime of New Zealand, currently considering a phosphate deep-sea mining project in its waters, and Japan, which became the first country to mine its deep seabed in 2017. The overview focuses primarily on states with active deep-sea mineral exploration, excluding shallow seabed or sand mining operations.[7]

4.1 General State Obligations

As discussed above, UNCLOS imposes broad obligations on states to protect the marine environment under their jurisdiction, including establishing laws and regulations "to prevent, reduce and control pollution of the marine environment arising from or in connection with seabed activities subject to their jurisdiction" (Article 208 (1)(2)), in line with international standards (Article 208(3)). Article 214 specifically obligates the enforcement of such domestic legal regimes, established for the purposes of regulating pollution arising from seabed activities.

[7] In general, our definition of DSM entails harvesting mineral deposits in the deep sea at depths ranging from approximately 400–6000 m below sea level (Hunter et al. 2018; Miller et al. 2018).

In addition to the obligations imposed by the UNCLOS, all states are under a wide array of legal obligations with respect to established international environmental law principles, such as the obligation to avoid transboundary harm, the precautionary approach, biodiversity commitments and the need for independent and robust environmental impact assessments (EIAs) and environmental monitoring. To the extent that DSM may cause climate-related impacts (Levin et al. 2016), states are also bound by their commitments to international climate change instruments, including the UNFCCC, the Kyoto Protocol and the Paris Agreement.

Outside the realm of environmental protection, extractive activities which impact human health and other basic human rights (such as the right to work, the right to a livelihood and an adequate standard of living, the right to health, the right to housing and property rights) will trigger further protections under various binding international human rights treaties, widely ratified by most states, including the countries assessed below. Furthermore, indigenous peoples, who are disproportionately impacted by extractive activities – including by impending seabed mining plans, particularly in the Pacific region – should be consulted and their free, prior and informed consent (FPIC) obtained with respect to future development activities threatening to impact them on their traditional territories, regardless of where the actual activity occurs (Szablowski 2011; Anaya 2015). Given that much seabed mining could occur in or near the waters of Pacific Islands as well as other countries with indigenous populations, FPIC should be sought in the seabed mining context (Hunter et al. 2018; Aguon and Hunter 2019).

To a large degree and as evidenced below, most of these relevant principles have not yet been incorporated into domestic DSM regimes (and are also largely absent from current ISA regulations). Basic environmental principles, where included, lack specific requirements or obligations laid on either contractors or states. Coverage of human impact and specific mechanisms for consultation, consent or remedies generally remain absent. In short, domestic DSM regimes tend to share the same characteristics of the international regime, weighted towards facilitating exploitation and a contractual regulatory regime, rather than towards preventing potential impacts or environmental degradation. Below we explore some of the geopolitical realities that have produced this state of affairs in the Pacific Island region.

4.2 The Pacific Context

As the world's largest ocean, the Pacific is home to a high concentration of prospective mineral sites due to geothermal activity around the "Ring of Fire", as well as other geophysical features. In addition to the Clarion-Clipperton Fracture Zone (CCFZ) and other sites in the Area, the seabed areas of New Zealand, Japan and various Pacific Island (PI) nations[8] have garnered the attention of those seeking access to mineral deposits.

[8] In this chapter, PI nations refer generally to the 14 member countries of the SPC-EU DSM Project

Generally speaking, PI nations have limited experience with mining. Where terrestrial mines exist in the region, they have often been associated with disastrous environmental, social and cultural impacts. Although many PI governments are interested in possible revenue accruing from mineral deposits, they are ill-equipped to effectively monitor DSM, enforce regulations and collect taxes and other levies from large multinational companies. Many PI nations lack coast guards or ships to police their own waters from overfishing and other illegal activities and are short-staffed within environmental and ocean agencies where they exist (Blue Ocean Law & Pacific Network on Globalisation 2016). A large number of failed mines and associated environmental disasters, particularly in Papua New Guinea, raise the possibility that even with model legislation, PI nations will have difficulty meeting their obligations for enforcement and avoiding pollution arising from seabed mining under Article 214 of UNCLOS.

Nonetheless, interested parties have proceeded to negotiate directly with PI governments for access to minerals contained within waters of national jurisdiction. The European Union (EU) has been particularly active in this regard, funding the Secretariat of the Pacific Community – European Union Deep Sea Minerals Project (SPC-EU DSM Project),[9] whose objectives include improving the governance and management of PI nations' deep-sea mineral resources in accordance with international law, with particular attention to the protection of the marine environment, and securing equitable financial arrangements for Pacific Island countries and their people. Underlying these stated aims, however, is the EU's desire to access alternative mineral sources. Documents submitted to the European Parliament reveal the EU's dependency on imports of "high-tech" metals such as cobalt, platinum, rare earths and titanium, increasingly essential to the development of technologically sophisticated products. The EU's 2008 "Raw Materials Initiative" seeks to avoid supply crises and diversify access to raw materials beyond somewhat unstable suppliers in Africa, China and South America. Although a 2018 European Parliament resolution calls for a moratorium on commercial DSM exploitation licences until the effects of DSM are better understood,[10]it is non-binding in effect and does not appear to have resulted in an actual policy shift with respect to either the Raw Materials Initiative or European states' national DSM agendas.

In this context, the SPC-EU DSM initiative is better understood as an attempt to establish deep-sea mining frameworks in PI nations in order to gain access to PI minerals.

(excluding only Timor-Leste): Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

[9] The EU provides €4.4 million in funding for the project.

[10] European Parliament Resolution of 16 January 2018 on International Ocean Governance: An Agenda for the Future of Our Oceans in the Context of the 2030 SDGs (2017/2055(INI)), P8_TA-PROV(2018)0004, para 42.

4.3 SPC Regional Legislative and Regulatory Framework (RLRF)

The SPC-EU DSM Project has produced several frameworks and guidelines intended to enhance the capacity of PI nations to manage DSM. Among these is the "Pacific-ACP States Regional Legislative and Regulatory Framework for Deep Sea Minerals Exploration and Exploitation" (RLRF), a discussion document designed to assist PI states in their development of national policy and law for DSM. The RLRF has served as a template for national legislation in the region.

The RLRF advises states to incentivize investors by providing a setting that fosters investment (§4.3), encouraging states to provide predictable and stable governance, reasonable taxation and legislation that account for corporate risks and investments (§§10.5–10.7). While emphasizing the benefits of DSM throughout the document, the RLRF characterizes potential adverse effects from DSM-related activities as "extremely minimal" (§20.2) or as having "almost no impact" (§18.6). It claims that an environmental impact assessment (EIA) may or may not be necessary depending on the project size and that different levels of EIAs may also be sought (§18.8), allowing activities that will have a "minor or transitory impact" to proceed without any EIA (§§18.8–18.9). The RLRF also reframes potentially negative impacts as opportunities for research, science and education, while insufficiently addressing any negative impacts of DSM in the initial, prospecting phase (§§4.5–4.8).

Despite numerous references to the precautionary approach, the RLRF's general minimizing of risks seemingly contravenes the goal of the approach. The framework includes no mention of DSM's potential impacts on climate change and related obligations under the UNFCCC or the Kyoto Protocol. The RLRF also mentions indigenous peoples only once (§6.16), despite being designated for use in the largely indigenous Pacific Islands, relying instead on terms like "citizens" and the "public". This obfuscates the special duties owed to indigenous peoples under international law (Anaya 2005). The framework similarly skirts over the idea of FPIC, mentioning informed consent twice, but not directly in relation to indigenous peoples (§§4.7, 16.3).

In short, the RLRF pays lip service to environmental protection while also greenlighting DSM interests in the Pacific. Given this basis, it is unsurprising that individual country legislation regulating DSM in the Pacific is similarly uneven or, in some cases, even more deficient with respect to international environmental law, indigenous rights and other international law standards. The following sections examine three Pacific Island country regulatory frameworks (Papua New Guinea, Tonga and the Cook Islands) in this context.

Papua New Guinea

Papua New Guinea (PNG), the biggest country in the Pacific Island region with a population of around eight million, has been selected for the world's first commercial DSM operation by Nautilus Minerals, a Canadian company and leader in DSM technology. At its proposed mine site, Solwara 1, Nautilus plans to commercially exploit gold and copper deposits associated with deep-sea hydrothermal vents at a depth of around 1600 m in the Bismarck Sea, approximately 30–50 km from coastal and indigenous communities living on the islands of New Ireland and East New Britain, respectively. The project has raised concerns and significant opposition among PNG civil society, including a court case lodged against the government to obtain documents regarding Solwara 1's approval process, and has experienced persistent delays as a result of funding and other setbacks (Roche and Feenan 2013).

To date, PNG has no formal deep-sea mining legislation or framework for the permitting of an offshore mining operation. Rather, DSM in PNG falls primarily under the Mining Act of 1992, as well as the Environment Act of 2000 (Boschen et al. 2013). Nautilus received its initial exploration licences under the Mining Act in 1997 and subsequently again in 2011.

The 1992 Mining Act is a somewhat antiquated law designed primarily to facilitate onshore mining through technical and administrative provisions. It declares all minerals to be owned by the national government (§5), with only one mention of the seabed in the definition of "land" (Mining Act (1992), §2(1d)). The Act contains no mention of the precautionary principle, transboundary harm or FPIC and very little regarding environmental protection generally, with nothing on EIAs and just one mention of the environment in a section on assessing an application for a mining lease (§43). There is no discussion of consent in the context of indigenous peoples or customary resource users. The one provision regarding consultation allows the Mining Minister "to consider the views of those persons whom the Minister believes will be affected by the grant of that special mining lease", including the provincial government, landholders of the land in question, the national government and the mining applicant (§3 "Consultation") – essentially excluding members of local communities, indigenous peoples, civil society organizations (CSOs) and other stakeholders while leaving consultation entirely to the discretion of the Minister. There are no provisions for community revenue-sharing agreements, also known as Impact Benefit Agreements (IBAs), which exist in jurisdictions such as Canada and have proven to alleviate social and environmental ills associated with the extractive industry (Kielland 2015).

The 2000 Environment Act attempts to address some of the gaps of the 1992 Mining Act. Administered by the Department of Environment and Conservation, it requires an environmental impact statement (EIS) prior to permits for mining being granted, with further conditions including installation of monitoring equipment, undertaking an environmental management programme, baseline studies and a rehabilitation programme (Boschen et al. 2013). Under the legislation, companies seeking to obtain a mining lease must complete an Environmental Inception Report and an EIS, to include "physical and social environmental impacts which are likely

to result from the carrying out of the activity" (Environment Act (2000), §51(b)). The Director of Environment assesses the EIS, may refer the EIS to other bodies for additional assessment and makes the report available for public review (§§55–57). If the Director accepts the EIS, it passes to the Environmental Council for assessment and recommendation to the Minister (§57). Unfortunately, the Director of Environment under the Act also serves as the Chairperson of the Environmental Council, diminishing the independence of this system of review (§17).

The mining and environmental regimes in PNG, taken together, have been criticized for their inability to stem major environmental disasters and industrial operations, culminating in civil conflict and severe human rights violations in PNG. PNG's Environment (Water Quality Criteria) Regulation 2002 permits the dumping of toxic wastes into PNG's rivers and coastal waters, leading to extensive pollution and water contamination associated with multiple terrestrial mining sites. Corruption, violence and land-grabbing are rampant, making effective governance and enforcement of environmental regulations notoriously difficult (May 2017).

With respect to seabed mining, the regulatory and operational environment in PNG does not bode well for effective enforcement or monitoring. Although a consultation process to discuss amendments and to update the old Mining Act to include offshore mining and grievance mechanisms began in 2013, neither the updated mining policy nor amendments to the Act appear to have been passed or made public. This remains the case despite the fact that full-scale DSM under Nautilus has been imminent for the past couple years (Blue Ocean Law & Pacific Network on Globalisation 2016).

As an operating theatre, PNG's high poverty levels, inequality, civil conflict and insufficient rule of law (UNDP 2014) raise concerns that even with model DSM legislation, a major undertaking in crowded territorial waters close to populated shores would be insufficiently regulated, leading to significant harms with disproportionate impact on indigenous coastal communities.

Tonga

Tonga, a Polynesian country located in the South Pacific, comprises 176 islands scattered over approximately 700,000 km^2 of ocean. With a population of around 107,000, Tonga is the last remaining Polynesian monarchy and still fairly new to the exercise of parliamentary democracy, to which it transitioned in 2010.

Tongan waters contain seafloor massive sulphides (SMS) at depths ranging from 600 to 2000 m below the surface. According to the Ministry of Lands and Natural Resources, around one-fifth of Tongan waters have been licenced for DSM exploration, primarily to Nautilus Minerals, the Korean Institute of Ocean Science and Technology (KIOST) and Bluewater Metals (Blue Ocean Law & Pacific Network on Globalisation 2016).

In August 2014, the previous administration of Tonga passed the Seabed Minerals Act into law. Prior to the law's passage, the government permitted companies to explore without a designated legislative framework (Pulu 2013), issuing contracts

under outdated mineral and petroleum mining laws. The 2014 Seabed Minerals Act is the governing regulatory framework that expresses the major aims and guidelines surrounding DSM.[11]

Unlike PNG's Mining Act, Tonga's 2014 Seabed Minerals Act (SMA) is based on the SPC-EU DSM framework. SPC-EU officials and lawyers worked closely with Tongan government officials, providing funding as well as actual draft legislation based on the RLRF, which Tonga then adapted and enacted. In particular, provisions on consultation were shortened, based on the premise that all resources in the Kingdom are vested in the Crown, and therefore consultation or consent from communities was largely unnecessary for extractive projects (Blue Ocean Law & Pacific Network on Globalisation 2016).

While the SMA does emphasize the precautionary principle and the importance of environmental protections, it lacks sufficiently developed protections for indigenous and coastal communities, as well as recognition of the potential harms of DSM and the need for remedy or grievance mechanisms. The legislation also contains provisions which are likely unenforceable due to capacity issues. For instance, the SMA calls for the establishment of a separate Tonga Seabed Minerals Authority, with Minister, CEO and staff to carry out numerous administrative and regulatory functions relative to DSM (Seabed Minerals Act 2014, §§9, 12 "Functions of the Authority"). In practice, Tonga lacks the resources to establish a separate Seabed Minerals Authority. Similarly, the government tends to outsource its EIA work, and lacks sufficient lawyers to enforce regulations and carry out oversight. Tonga has had trouble enforcing the collection of domestic fees and taxes and lacks the capacity to prosecute offenders for non-payment, resulting in underfunding of various government functions, including oversight and monitoring of major development projects (Blue Ocean Law & Pacific Network on Globalisation 2016).

Tonga reportedly possesses only three patrol boats, depending primarily on the New Zealand and Australian air forces for ocean surveillance. One Tongan government observer is sent out on mining vessels in the exploration phase, a practice that is expected to continue during actual mining. According to the Geology Department of the Ministry of Lands and Natural Resources, the companies currently operating in Tonga have been reluctant to provide detailed information to the government regarding the grade of minerals, the specific location of mine sites and ocean floor imaging, despite being legally required to do so. The government is concerned that companies may not share valuable genetic and biodiversity data or centralize data gathering in a way that would be useful to scientists and Pacific communities (Blue Ocean Law & Pacific Network on Globalisation 2016).

In short, while Tonga's DSM regulatory regime appears somewhat inclusive of environmental protections, it falls short with respect to social and consultative provisions. Lack of institutional capacity raises serious concerns of non-enforcement of DSM regulations, leading to irremediable environmental damage in a country already facing dire threats from sea level rise and climate change.

[11] A separate, more detailed law implementing the framework and elaborating procedures relating to fees, forms and regulations was reportedly in the works, as of 2016.

Cook Islands

The Cook Islands (CI), an archipelago of small islands with a population of approximately 17,000 people, is exploring the possibility of mining its EEZ for mineral deposits amounting to around ten billion tonnes of polymetallic manganese nodules (MNs), located at depths of 3000–6000 m (Cook Islands Seabed Minerals Authority 2018). The Cook Islands has been actively pursuing the development of a DSM industry, requesting assistance with regard to a comprehensive regulatory framework and sovereign wealth fund from the SPC-EU DSM Project, as well as from the International Monetary Fund and other advisers. CI has an established Seabed Minerals Authority, reporting to the Minister of Finance and comprising a Seabed Minerals Commissioner, a Legal Advisor and a Natural Resources Advisor (funded by the Commonwealth Secretariat). Although a 2016 tender for exploration received no bids, the Cook Islands has since entered into negotiations with multinational companies and foreign governments regarding both exploration in its EEZ and Cook Islands' sponsorship of DSM in the CCFZ. In 2016, CI signed an exclusive agreement with Ocean Minerals, an American company, to prospect for potential new sources of rare earth elements (REE) and scandium in its seabed.

With respect to legislation, the CI Parliament passed the Seabed Minerals Act in 2009, making it one of the world's first national legislations dedicated to regulating seabed mineral activities.[12]

Although CI legislation has been held up as a model framework in the region, it is heavily technical and focuses primarily on facilitating the mining regime. It contains no mentions of the precautionary principle or the avoidance of transboundary harm and very little on consultations with affected communities or the public. A separate instrument, the 2015 Seabed Minerals (Prospecting and Exploration) Regulations, contains a short section requiring DSM companies to apply the precautionary approach; however, it provides no instructions on how to do this in the context of DSM in the Cook Island's EEZ (Seabed Minerals (Prospecting and Exploration) Regulations 2015, §§9, 50). These regulations also have a short section on community consultation, whereby "the Authority *may* consult with the community in relation to any Application for a Title" (§37 emphasis added). This mirrors the permissive language in the original 2009 Seabed Act in which certain environmental provisions are also made optional with respect to the granting of prospecting permits (Seabed Minerals Act 2009, §91 (3)(f)).

In 2017, the Parliament of the Cook Islands passed Marae Moana, a bill creating one of the world's largest ocean sanctuaries. The Marae Moana Act provides zoning for different users, including mining operators, with no seabed mining allowed within 50 nautical miles around all islands of the Cook Islands (Marae Moana Act (2017), §24). The Act has not affected CI's current exploration contracts, however, and does not prohibit seabed mining throughout most of the reserved area, although it does restate the precautionary principle as well as a principle of community

[12] The Seabed Minerals Authority was subsequently established by the CI Government Cabinet in 2012. The Seabed Minerals Act 2009 officially entered into force on March 1, 2013.

participation (§5(c, d)). The Cook Islands appears to now be in the process of amending its seabed mining legislation and policy to be more in line with the principles of the Marae Moana Act and best practice, including possible mention of the precautionary approach and FPIC (Draft Documents 2019); it remains to be seen whether and how these principles will be operationalized and prioritized.

Pacific Islands Summary

The three legislative regimes discussed above, while different, suffer generally from the same fatal tendencies when considering the likelihood of environmental protection in the DSM realm: first, omissions related to mandatory environmental protections, and second, the absence of sufficient provisions on consultation and consent. The lack of an integrated, streamlined approach to regulating DSM – one that can actually be operationalized in the context of small island states with limited capacity – is reflective of legislative frameworks throughout the region. Many states, like PNG, still have old terrestrial mining laws in place from the 1990s, while others, similar to Tonga, possess newer legislation that mirrors the SPC's RLRF but is unlikely to be successfully implemented and enforced given resource constraints (see, e.g. the case of Tuvalu, a country of approximately 11,000 people, with two types of DSM deposits in its waters) (Blue Ocean Law & Pacific Network on Globalisation 2016). Moreover, DSM tends to fall under the purview of multiple government departments, with competing and often conflicting aims, in which better-resourced economic development departments and mineral authorities often win out over comparatively weak environmental or fisheries divisions (a problem faced by many national governments outside the region as well).

In short, even with improved, comprehensive legislation, concerns remain that in practice many of these jurisdictions will be unable to achieve sustainable resource management. Table 1 provides an overview assessment of these three jurisdictions.

4.4 New Zealand

DSM is in the exploratory stage in New Zealand (NZ), which contains reserves of SMS deposits and manganese nodules in its EEZ of over four million square kilometres (Lamping 2016). As a jurisdiction with substantially more resources and capacity than other PI nations, as well as established rule of law and comparatively institutionalized protections for its own indigenous peoples, New Zealand is in a better position to effectively legislate DSM and provide some form of regulatory oversight. It has nonetheless faced substantial civil society opposition with respect to proposed seabed mining operations,[13] including Chatham Rock Phosphate Ltd's

[13] Much publicity has centred around Trans-Tasman Resources' application to mine iron sands from the seabed of South Taranaki Bight, located 22–36 km offshore from Patea at depths of

Table 1 Assessment of DSM regulatory regime under norms of international law

	Precautionary principle	Transboundary harm	Polluter-pays principle	FPIC[a]	Other indigenous protections
Papua New Guinea	No mention in Mining Act; one general mention in Environment Act	No mention	Some mention of operator's duty to compensate for environmental harm; unclear how this works in the case of DSM	No mention	Brief mention of customary landowners
Tonga	Mentioned in general, vague terms	No mention	Brief mention of operator's obligation to compensate for and indemnify Tonga from costs relating to environmental harm	Mentioned once, not in relation to indigenous persons	None
Cook Islands	No mention in 2009 Act; mentioned in 2015 Regulations	No mention	Some mention of duty to compensate for environmental harm; regulator has discretion to apply environmental remedies	No mention	None

[a]*FPIC* free, prior and informed consent

attempts to mine a nodular phosphate deposit at 400 m water depth between the east coast of the South Island and the inhabited Chatham Islands (Nielsen et al. 2015). A 20-year seabed mining permit was granted to the company in late 2013, with feasibility studies to be completed shortly thereafter. In 2015, however, the NZ Environmental Protection Authority denied Chatham Rock Phosphate Ltd's application for a marine consent permit, finding that "there would be significant and permanent adverse effects on the existing benthic environment" (Decision on Marine Consent Application Chatham Rock Phosphate Limited (2015), §864) and that the destructive effects of the extractive activity, coupled with the potentially significant impact of the deposition of sediment on the areas adjacent to the mining blocks and on the wider marine environment, could not be mitigated by any set of conditions or adaptive management regime that might reasonably be imposed (Decision Summary, xviii).

between 20 and 42 m (thus not "deep-" sea mining, per se). TTR's application was denied by the NZ EPA in 2014, only to be approved in August 2017. The EPA's decision was overturned on by the High Court in Wellington (New Zealand Herald 2018), a decision currently being appealed by TTR and and crcross-appealed by environmental and indigenous groups at the Court of Appeal (Howard 2018).

According to news reports, Chatham Rock Phosphate is planning to resubmit a marine consent application to the EPA, anticipating completing the EPA reapplication process and hearing by early 2020 (Hartley 2018).

Seabed mining in New Zealand currently falls under two pieces of national legislation: the Crown Minerals Act 1991[14] and the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act (2012) ("the EEZ Act"), which manages the environmental effects of numerous activities, including SMS mining, beyond the 12 nautical mile limit (Boschen et al. 2013). Under the EEZ Act, the Environmental Protection Authority (EPA) is responsible for managing the effects of activities such as seabed mining beyond the territorial sea, specifically defining mining activity to include "areas of the seabed likely to contain mineral deposits" as well as "the taking or extraction of minerals from the sea or seabed, and associated processing of those minerals" (§4(1)). DSM would require a publicly notified marine consent from the EPA, which involves preparing an application and impact assessment, as well as a nationally notified public process in which the public can make submissions, present at a hearing and appeal decisions (§§38–52). In making its decision, a marine consent authority would be required to take into account various criteria, including effects on the environment and human health, biodiversity and species protection, existing interests, economic benefit and other matters (§59). The EEZ Act also includes provisions for a Māori Advisory Committee to provide advice to the EPA and/or to a marine consent authority, "if its advice is sought" (§18).

Although New Zealand's EEZ Act is undoubtedly stronger on environmental protection and inclusion of indigenous input than other legislation in the region, it does not make specific reference to the "precautionary approach", exhorting the Minister to instead "favour caution and environmental protection" if "in relation to the making of a decision under this Act, the information available is uncertain or inadequate" (§34). Although the sentiment is similar to that of the precautionary approach, the wording, as pointed out by both the New Zealand Green and Labour Parties, does not define what "caution" entails and is therefore unclear (Commentary 2011). Both parties also highlight concerns with the bill's provision requiring the Minister to first consider providing for an adaptive management approach if favouring caution means that an activity could be prohibited, given circumstances where adaptive management is inappropriate, as in cases with a risk of significant or irreversible environmental harm. The bill also specifically prevents the marine consent authority from considering "the effects on climate change of discharging greenhouse gases into the air" (§59(5b)), despite the serious risk of seabed mining-associated climate impacts (Levin et al. 2016).

Finally, notwithstanding token language on Māori input (although excluding the indigenous Moriori of the Chatham Islands), the provisions in the EEZ Act do not rise to the level of FPIC and may even fall short as consultative measures, given their optional nature. The Act could be significantly strengthened by including additional

[14] The Crown Minerals Act 1991 is similar to older mining acts from this period and contains only one mention of the seabed in the definition of land (§2(1)).

concrete mechanisms for indigenous participation in decision-making, in conformity with New Zealand's domestic law and international indigenous rights law.[15]

New Zealand's ability to take decisions denying marine consent applications for seabed mining and halting the issuance of new oil and gas offshore exploration permits indicates a regime with stronger rule of law, environmental protections and enforcement ability than many of its Pacific counterparts. That said, New Zealand's DSM legislation needs to clearly delineate the precautionary approach, incorporate climate concerns into marine consent decision-making processes and bolster community and indigenous protections.

4.5 Japan

Japan, one of the world's biggest economies with an ocean area in the top ten, has led efforts to exploit seabed minerals. It has done this in part to reduce its dependency on external imports, being highly reliant on critical metals for domestic manufacturing (particularly in high-tech and consumer electronics). Given its dependency on China for rare earth metals,[16] Japan, as a matter of national urgency, has sought to develop its own resource supply, including in the Area but also in its EEZ. It has made steady progress developing seabed mining technology, in 2012 launching a Rare Earth Research and Technology Centre in Hanoi, Vietnam, as part

[15] See, e.g. more from the Labour and Green Parties: "The Green Party is concerned about the limited way in which the Crown's obligations under the Treaty of Waitangi are implemented. Clause 14 provides for ways in which Māori may participate in decision-making but imposes no broader obligation on the Crown.

The bill should impose a general obligation on the Crown to administer and interpret the Act so as to give effect to the Treaty/Te Tiriti principles as legislation such as the Conservation Act 1987 does. And as iwi such as Ngāi Tahu sought, it should parallel the RMA to require the relationship of iwi and their culture and traditions with the marine environment, including taonga species, to be recognised and provided for in achieving the purpose of the Act"; "Labour is disappointed that iwi were not consulted in the drafting of this legislation. We share the concern of submitters that consultation with, and involvement of, iwi throughout the processes outlined in the bill are only optional and at the discretion of the EPA, especially given the lack of consultation so far. Labour members also support the submission of the Hokotehi Moriori Trust that the bill be amended to include reference to "Māori and Moriori" and "tikanga Māori and tikane Moriori" throughout the bill" (Commentary 2011). Further critiques from commentators include that the marine consent "applications are considered in the absence of a national planning framework for managing the oceans beyond our territorial seas. In addition, the EEZ Act is not currently supported by guiding documents such as national environmental standards, policy statements or plans that apply to the management of New Zealand's coastal marine area…. The absence of such documents or a planning framework presents a significant challenge for EEZ decision makers charged with deciding marine consent applications, and operators looking to exploit New Zealand's mineral resources" (Lamping 2016).

[16] When China cut its export quotas on rare earth minerals by 40% in 2010, prices soared, leading the US, joined by the EU and Japan, to bring a case against China in the WTO's dispute settlement body, which ruled against China. China subsequently dropped its quotas (World Trade Organization 2017).

of its rare earths' diplomacy initiative. In August 2017, Japan became the first country to successfully mine its seabed, tapping into a deposit of mineral resources 1600 m below the ocean's surface off the coast of Okinawa (McDonald 2017). In April 2018, a study published in *Scientific Reports* revealed that a deep-sea mud deposit at depths of close to 6000 m located within Japan's EEZ near Minami-Torishima Island could contain enough rare earth metals to potentially meet the world's supply "on a semi-infinite basis" (Takaya et al. 2018). Japan also holds two exploration contracts under the ISA to explore cobalt-rich ferromanganese crusts in 3000 km^2 in the Western Pacific Ocean, as well as polymetallic nodules in the CCFZ.

Japan's original Mining Act dates from 1950 and contains few provisions on environmental protection as well as no mention of the ocean or seabed minerals (Mining Act 1950). The original law also reportedly contained no regulations to check whether applicants had adequate technology, financing, track records and exploration and development plans; projects were automatically approved on a first-come first-served basis, resulting in companies receiving approval before better-qualified firms could apply (Kikkawa 2013). By the end of March 2010, the Japanese government had reportedly granted 8179 exploration rights, of which 81% remained undeveloped (Kikkawa 2013).

In 2011, Japan amended the Mining Act for the first time, responding to the need to ensure resource independence and increase domestic production. The changes, effectuated in January 2012, were primarily concerned with restricting the "first to file" arrangement in order to stimulate domestic natural resource development and make the mining system more efficient (Kikkawa 2013).

In 1982, Japan adopted the Law on Interim Measures for Deep Seabed Mining. This relatively short (~20 page) law is designed to "contribute to the promotion and extension of the public welfare through the rational development of deep seabed mineral resources" (Law on Interim Measures for Deep Seabed Mining (1982), Article 1). Permission to deep-sea mine is granted through the Minister of International Trade and Industry (Article 4), based on compliance with the standards set for mining areas by the Minister as well as sufficient financial standing and technological capability (Article 12). There is virtually nothing in the law regarding the environment or consultation, although there is a section on compensation for damages caused by "the discharge of wastewater, the accumulation of rubble or slag or the release of mineral smoke accompanying deep seabed mining in Japan" (Article 27), as well as a section establishing penalties and fines for violating provisions of the law (Chapter 6, Penal Provisions).

Although neither the Mining Act nor Japan's seabed mining law contains provisions on impacts to marine ecosystems, Japan possesses numerous domestic environmental laws that would inform its DSM regulatory regime, including the Basic Environment Law (1993), the Act on Prevention of Marine Pollution and Maritime Disaster (1970, No. 136), the Environmental Impact Assessment Law (1997, No. 81), the Law Concerning the Promotion of Business Activities with Environmental Considerations (2004, No. 77), the Act on the Exclusive Economic Zone and Continental Shelf (1996, No. 74) and the Act on Protection of Cultural Properties, as well as a Basic Act and Plan on Ocean Policy and biodiversity and climate change regimes. The Ocean Policy in particular emphasizes conservation and securing

marine biodiversity (Basic Plan on Ocean Policy (2013), Chap. 2 Sect. 2). However, it also clearly calls for the promotion and development of energy and mineral resources including seabed minerals.

It is beyond the scope of this chapter to assess the entirety of Japanese laws relevant to DSM. However, the technical, sparse nature of the older mining laws raises concerns that environmental and social protections have not yet been adequately incorporated into the seabed mining regime and that a clear, integrated approach may not exist (Tatsuya 2017). Given Japan's rush to secure domestic mineral sources, there is a risk that environmental and social consequences, including transboundary harm to other states resulting from mining in Japan's waters and subsequent liability claims, could occur without adequate domestic regulatory legislation.

Domestic DSM Legislation Summary

In sum, Sects. 3 and 4 illustrate the need for domestic legislation to regulate DSM activities, even in the context of activities in the Area. As such, we find it useful to collate a non-exhaustive list of states with domestic legislation in place to govern DSM activities (taking place either within domestic jurisdiction or in the Area or both), as shown in Table 2.

5 Conclusion

This chapter has explored the national and international regulatory frameworks for DSM activities from the perspective of marine environmental protection. In particular, it has highlighted the need to standardize a precautionary, protective approach between the national and international seabed mining regimes, emphasizing that the current state of affairs – in which the international regime under the purview of the ISA is subject to the common heritage of mankind, but DSM in areas within national jurisdiction is left entirely to states – requires due attention.

Given the critical role of ocean ecosystems, in particular the seabed, in regulating climate and any number of other vital biodiversity functions, DSM activities, irrespective of where they take place, are a matter of "common concern to humankind" due to the harmful effects they are likely to cause to the marine environment. The latest advances in science validate these invaluable ecosystem services, while the deep ocean and its biodiversity are already established as common concerns of humankind. DSM activities should likewise be subjected to the same treatment (Hunter et al. 2018). As such, specific considerations under international law apply, including the due diligence obligation to regulate the activity effectively, as well as to exercise control over and, where necessary, enforce such regulations. Thus, in the case of activities in the Area, DSM contractors (i.e. the actual "polluters" that are responsible for the environmental degradation) in particular must account for the harm caused to the marine environment as it affects the community interest in favouring its protection (Sun 2018). This obligation is owed erga omnes and all

Table 2 Countries with domestic legislation pertaining to DSM activities

Country	DSM legislation
Belgium	Act on prospecting and exploration for, and exploitation of, resources of the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction/Loi relative à la prospection, l'exploration et l'exploitation des ressources des fonds marins et leur sous-sol au-delà des limites de la jurisdiction nationale (2013)
China	Law of the People's Republic of China on Exploration for and Exploitation of Resources in the Deep Seabed Area (2016)
Cook Islands	Seabed Minerals Act (2009)
Czech Republic	Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Act No. 158 of 18 May 2000
Fiji	International Seabed Mineral Management Decree 2013 (Decree No. 21)
France	Law on the Exploration and Exploitation of Mineral Resources on the Deep Seabed 1981, Law No. 81-1135 of 23 December 1981
Germany	Seabed Mining Act of 6 June 1995; amended by article 74 of the Act of 8 December 2010
Italy	Regulations on the Exploration and Exploitation of the Mineral Resources of the Deep Seabed, Law No. 41 of 20 February 1985
Japan	Law on Interim Measures for Deep Seabed Mining, 1982
Nauru	International Seabed Minerals Act, No 26 of 2015
Kiribati	Seabed Minerals Act 2017
Russia	Provisional Measures to Regulate the Activity of Soviet Enterprises Relating to the Exploration and Exploitation of Mineral Resources of Seabed Areas Beyond the Limits of the Continental Shelf, 17 April 1982
Singapore	Deep Seabed Mining Act (2015)
Tonga	Tonga Seabed Minerals Act 2014
Tuvalu	Tuvalu Seabed Minerals Act 2014
UK	Deep-Sea Mining (Temporary Provisions) Act, 1981, chapter 53, 28 July 1981; Deep-Sea Mining (Exploration Licences) (Applications) Regulations 1982, No. 58; Deep-Sea Mining (Exploration Licences) Regulations 1984, No. 1230; Deep-Sea Mining Act 2014
US	Deep Seabed Hard Mineral Resources Act, 1980. Public Law 96-283, 28 June 1980, 94 Stat. 553 (30 U.S.C. 1401 et seq.), as amended 1 July 2000

*Note that multiple countries are believed to be in the midst of drafting or considering similar legislation: e.g. India, Republic of Korea, Federated States of Micronesia, Marshall Islands, Niue, Papua New Guinea, Solomon Islands and Vanuatu (ISA National Legislation Database).

states have an inherent interest in ensuring that it is effectively observed (Harrison 2017; Sun 2018). In this regard, treating international and national DSM activities as a matter of common concern would serve as a resounding call to ensure that regulations and standards adopted under both regimes are streamlined and harmonized.[17]

[17] Although states are required, pursuant to Article 208 of UNCLOS, to streamline their seabed exploitation activities and align them to standards agreed globally (or at least regionally), there is little evidence to indicate that such an endeavour is forthcoming. As a result differing standards and stringency in regulation would apply to both regimes, potentially causing efforts to protect the marine environment in one to cancel out the other. On the one hand, it is possible that stringent

Accordingly, failure by either regime to adopt and enforce necessary measures to protect the marine environment may attract responsibility under international law as well as domestic law. This could include substantial transboundary harm claims from states affected by DSM, particularly when their "rights and legitimate interests" are impacted from those activities,[18] as well as liability claims from private parties and other entities (e.g. commercial fishermen, tourism operators, indigenous groups, etc.).

Additionally, states are bound by an array of other laws applicable in the seabed mining arena, including broad and overlapping areas of environmental law stemming from the climate change regime among others, as well as international human rights obligations and special protective duties owed to indigenous peoples. All of these rights and laws may be implicated by DSM and must accordingly be considered and incorporated into national and international legislation, in order to create truly effective regulatory regimes designed to promote sustainability, prevent harm and conserve the common heritage of mankind – understood as extending beyond the pure monetary value of seabed minerals to include climate, biodiversity and other vital functions of the deep seabed.

As a parting note, we call upon states to come together pursuant to UNCLOS, in particular Article 197 (to cooperate both on a regional and global basis in formulating international rules and standards to protect the marine environment), Article 143 and Article 200 (to undertake scientific research to better understand the effects of DSM on the marine environment), Article 201 (to develop appropriate scientific criteria for the regulation of DSM) and Article 208 (to adopt standards that are no less stringent and effective than those agreed internationally). This effort would help ensure that if DSM activities take place (irrespective of whether they occur in the national or international seabed), they should be subjected to the highest environmental standards and the latest scientific knowledge; conducted in accordance with the precautionary approach and the polluter-pays principle; and remain accountable under all relevant areas of international law, with adequate monitoring and compliance mechanisms as well as appropriately enforceable legislative frameworks.

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regulation and exacting standards adopted in the Area could shift contractor interest to areas within national jurisdiction where operational costs could be lower. This, in turn, could induce coastal states to engage in a race to the bottom to attract investors with weaker, less protective regulations. On the other hand, some contractors could elect to proceed with activities in the Area under the same scenario. This would entail increased operational costs, resulting in reduced revenue, and thereby potentially undermining the common heritage of mankind (as reduced revenue results in fewer financial benefits being available for equitable distribution among states, while the mineral resources of the Area continue to deplete). Consequently, streamlining environmental standards in both areas is critical.

[18] Article 142(1) of UNCLOS.

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