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The Concept of Oceanian Sovereignty in the Context of Deep Sea Mining in the Pacific Region

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Based on an interdisciplinary experience addressing traditional dimensions in marine resource management in the Pacific, the socio-ecological interconnectivity between island communities, the ocean realm and the legal context concerning the management of seabed resources (Tilot, 2006, 2010; Tilot et al., 2018, 2021a,b; Mulalap et al., 2020; Willaert, 2020a,b,c; 2021; DOSI, 2021), this paper proposes to discuss the relevance and efficacy of the concept of "Oceanian Sovereignty" (Bambridge et al., 2021) in the context of Deep Sea Mining, from the different legal, environmental, anthropological, social, political, and economic science perspectives. The policies and practices developed in the Pacific in this context could well serve as a suitable model elsewhere to reconcile competing perspectives in addition to sustaining the Human Well-being and Sustainable Livelihoods (HWSL) and the health of the Global Ocean.

Keywords: traditional knowledge, Pacific Island communities, Rights of Indigenous Peoples, science-policy-society, human well-being and sustainable livelihoods, ocean governance, deep sea mining, global change

INTRODUCTION

The concept of the Blue Economy has come into increasing prominence since 2010, and perhaps nowhere more so than in many Pacific Island nations whose "sovereign" territory is overwhelmingly maritime. The Blue Economy espouses the idealized, but deeply problematic concept of sustainable development. The tension in this concept arises from the combination of the idea of economic expansion still being at the core of development, but now linked to conservation, ecosystem rehabilitation, and social justice and equity. There is an implicit assumption that the oceans can be both a source of sustainable (and expanding) revenue that will allow greater conservation and

rehabilitation of marine ecosystems under pressure from both unsustainable development and global warming (Ardron et al., 2008; Silver et al., 2015; Mallin and Barbesgaard, 2020).

Practices and discourses around deep sea mining (DSM) shed vivid light on the complexity of the conundrum in which stakeholders in such pioneering ventures find themselves, namely, a seemingly self-defeating double race toward conflicting goals: economic growth via scientific progress, on the one hand, and the respect and preservation of our planet's rich ecosystems on the other, in which partnerships with local communities are increasingly seen as fundamental (Childs, 2019). True technological progress increasingly allows us to escape this dry alternative: after all, apart from the more than €10 billion it might provide in annual turnover by 2030 (EU COM, 2012), the ambition of DSM is to serve as sources of metals in the twenty first century, in particular rare earth elements (REE) (Hein et al., 2020), and to help societies transition from carbon heavy fossil-fuels to renewable resources, in particular to supply Electric Vehicle Systems batteries (Takaya et al., 2018).

However, in practice, our ecological and economic imperatives often form deeply intricate—frequently intractable or even paradoxical—(Gordian) knots, as ecologically motivated decisions and policies often hide powerful economic and/or political ambitions (Campling and Colàs, 2017; Mackelworth et al., 2019; Mawyer, 2021) which, though in partnership with local communities, may be at odds with aspects of their sovereignty practices or aspirations. At the same time, economic decisions and policies might very well (intentionally or not) either impair or reinforce environmental measures and social justice measures (Byerlee et al., 2009).

Such intricacies, correlated with the current compartmentalization and hyper specialization of our scientific knowledge, the typically western overconfidence about what constitutes "proper" knowledge (The World Conservation Union, 1989) and, perhaps even more importantly, our deep ignorance about the short and long-term environmental impacts of DSM (ESCO CNRS IFREMER, 2014), clearly impose great caution (Tilot, 2010, 2019; Tilot et al., 2018). However wonderful and henceforth necessary technological progress is to humanity, now is a time for prudence and humility rather than hubris. By its name only, the Anthropocene (Crutzen, 2002) suggests heavy responsibilities and a collective duty to limit the injurious impact we make on the planet.

If moral and ethical responsibility, openness, and interconnection are indeed to be the watchwords of progress in the twenty-first century (Kacenelenbogen, 2010, 2017) then these concepts should be paramount in guiding the design of a pertinent regulatory framework establishing standards and guidelines for DSM—that is, inclusive and based on a recognition of the politics of mining as "embedded in a world of things, bodies, networks, and socio-economic relations" (Bakker and Bridge, 2006). An essential first step in that direction would be to consider vast oceanic spaces as not only bursting with precious (and mostly unknown in the deep) life, but also as a highly social and political locus, a "voluminous" (Bridge, 2013; Elden, 2013) or "ontological" space, that is, a political—even *moral*—actor in its own right (Lehman, 2013; Steinberg and Peters, 2015) and which is woven through with what we identify as dynamic issues of Oceanian sovereignty (Bambridge et al., 2021).

First articulated in the 1990s by Tongan-Fijian scholar Epeli Hau'ofa, "Oceanian Sovereignty" is a concept linking the right to make decisions on land and ocean spaces to cultural stewardship/guardianship developed in, and unique to, the Pacific Islands.[1] This concept is highly relevant to the seabed mining debate and should arguably be integrated more in scientific-based policies and legal frameworks (Hau'ofa, 1994; Mulalap et al., 2020; Bambridge et al., 2021). In this regard, it is notable that Cook Islands' marine use policy involves widespread community consultation and accommodates various forms of the Blue Economy within its Exclusive Economic Zone (EEZ), including marine species' protection (traditionally "ra'ui"-based) and seabed mining within the Marae Moana ("ocean sanctuary") (Cook Islands Government, 2016). Indeed, lessons learned from the collapse of Nautilus' seabed mining operation in 2019 in the Papua New Guinea due to a lack of consent of local communities (Rosenbaum and Grey, 2016; Filer et al., 2020), demonstrate that DSM and all aspects of the Blue Economy must include sensitivity to, and engagement with, local Pacific communities and sovereignty forms, as articulated by the concept of "Oceanian sovereignty," which is the foundation of holistic ecosystem-based and customary-based relationships (Blue Ocean Law and Pacific Network on Globalisation, 2016; Childs, 2019; Bambridge et al., 2021; Tilot et al., 2021a,b).

This paper proposes to discuss on the relevance of the concept of "Oceanian Sovereignty" in the context of deep sea mining in the Pacific based on current perspectives from a transdisciplinary approach. Insights on the traditional dimension of the marine environment for the Pacific Island States are placed in the shifting socio-ecological systems of the Pacific where deep sea mining would occur. Then, in view of sustainability, traditional and science-based management tools will be compared for best practices at local and regional levels. In the discussions a new transdisciplinary approach is fostered by the team of authors to propose specific management tools, in particular a sustainability index adapted to deep sea mining. In view of all elements evoked, the dynamic role of Oceanian Sovereignty could contribute to a socio-ecological perspective of deep sea mining in the Pacific Island States and serve as model elsewhere in the world.

THE TRADITIONAL DIMENSION OF THE MARINE ENVIRONMENT FOR THE PACIFIC ISLAND STATES

The traditional "oceanian way of being" (Hau'ofa, 1994) in the Pacific Island States helps islanders transmit their identity and unique relationship to each other, as well as connects them to their natural and cultural environment for generations in a continuum perspective (Bambridge, 2016). It also has

[1]It departs from the legal concept of sovereignty, according to which States, in the sphere where their authority is to be exercised (internally or externally), hold a power which is not exercised by any other power and which cannot be equaled by any other power.

been effective in meeting community and ecosystem goals by preventing communities from exceeding their local carrying capacity. Sovereignty and the urge for development in Oceania, rather than locally driven and respectful of cultural heritage, are another transforming force for the use of marine resources and minerals. During the last decades, traditional management systems and customary marine tenure processes have undergone revitalization in many Pacific island countries and have been acknowledged to a certain extent in several legal systems in the Pacific and a number of regional and international instruments, but this important connection can certainly be further developed (Veitayaki, 2004; Govan et al., 2008; Veitayaki et al., 2011; Bambridge, 2016; Tilot et al., 2021a).

The central tenet of Hau'ofa's oceanian way of being is that what western science and governance doctrine defines as user and regulatory rights derive not from territorial residence, but rather from sustained actions and commitment to fostering an environment and all its human interactions as guardians rather than mere users or residents. This vision is very compatible with the scientific management, as well as social and cultural justice as reflected, for e.g., in the "United Nations Declaration on the Rights of Indigenous Peoples" (UNDRIP, 2007). The latter establishes « "a universal framework of minimum standards for the survival, dignity and well-being of the indigenous peoples of the world and elaborating on existing human rights standards and fundamental freedoms as they apply to the specific situation of indigenous peoples" ».[2] The Oceanian way is also capable of accommodating diverse approaches as long as commitment in actions and consequences rather than merely arguments for the sustainable use of ocean spaces.

The Oceanian Peoples, the "people of the sea" (D'Arcy, 2006), are proficient navigators capable of reaching in giant outrigger canoes the different archipelagos, establishing colonies or maintaining trade with distant lands, relying on their intimate knowledge of marine species and processes (among other natural elements) to guide their voyages (Lewis, 1972; Kuhn, 2008; Gooley, 2016; Eckstein and Schwarz, 2019). Numerous Pacific Island Countries still practice the traditional art of navigating, using only one's senses and knowledge passed by oral tradition from master to apprentice, by memorizing the motion of specific stars, reading the shape of clouds, the colors of the sea, recording wildlife species, the shape of waves, currents and water temperature, in summary, using a "sensory ecology of ocean navigation" (Lohmann et al., 2008). This would resemble the sensory navigation used by migrating species in open seas such as sea turtles, sharks and cetaceans (Lohmann et al., 2008). It is also a way to show the deep connection to Nature of the Oceanian Peoples. These navigation routes were represented by ancient stick charts and by star compasses displayed by shells on sand. In the Marshall Islands, for example, this approach appeared to be far more sophisticated than present navigation with sextant, compass and maps (Romm, 2015).

It is notable to outline the cross-cultural issues in conceptualizing sea space (Jackson, 1995) and express the dynamics of transdisciplinary knowledge from all stakeholders into Integrated Local Environment Knowledge (ILEK) (Kitolelei and Sato, 2016). The processes of transformation of ILEK into perceptions, collective actions, social learning and hypothesis generating processes are enablers to achieve sustainable resource management (**Figure 1**). Although DSM would not currently be considered as a sustainable activity (Tilot, 2019), we would recommend to use the ILEK processes prior to DSM to better sensitize local communities to DSM processes and thus minimize future socio-ecological impact.

PLACING DEEP SEA MINING IN THE SOCIO-ECOLOGICAL SYSTEMS OF THE PACIFIC REGION

Deep Sea Mining cannot be understood when disconnected from planetary boundaries (Galaz et al., 2012) within which the resilience and adaptive capacity of socio-ecological systems is (still) possible, as these systems are strongly coupled, highly complex, and changing rapidly, thus placing them at the center of research that addresses the impacts of ecological change on human societies (Bograd et al., 2019). Because of the location of the current DSM "hotspots" and the active participation of several regional States (Cook Islands, Nauru, Kiribati, Tonga) in DSM ventures (ISA, 2011a,b, 2012, 2014), this emerging industry is bound to have a significant impact on the whole Pacific region, its people and the relevant socio-ecological systems. The fact that communities do not have sufficiently close geographic proximity with actual DSM sites, which are located both within and beyond the limits of national jurisdiction, obscures the socio-ecological and ontological relationship these communities share with their environment. According to such obtuse or reductive understanding, it is worth noting that the environmental dimension of DSM is the primary dimension to be valued and therefore studied in the literature [Baker and Beaudouin, 2013; United Nations Environment Programme (UNEP), 2014; Bourrel, 2015; UNEP-WCMC, 2016; Bradley and Swaddling, 2018; Sharma, 2019; Singh and Hunter, 2019; UNESCO, 2019; Kakee, 2020] This would explain why most of the Pacific Island communities have a distant deep sea "minescape," by reference to environmental impacts, with actual DSM sites located both within and beyond the limits of national jurisdiction (Ey and Sherval, 2016).

This vision obscures the highly complex socio-ecological and ontological relationships between these communities and their marine and coastal environments which are also changing rapidly. Traditionally, these often extended beyond current EEZ and state maritime boundaries to other island communities, now belonging to different nations. Such relationships are evident, for instance, in practices of traditional tuna fishing spots around Fish Aggregating Devices (Gillett, 1987), or over seamounts (Bonneville et al., 2002).

Furthermore, this distancing is accentuated by the complex and fragmentary nature of law and institutions governing DSM and more generally, the marine environment and ocean space as well as activities taking place at sea. Against this background,

[2]https://www.un.org/development/desa/indigenouspeoples/declaration-on-the-rights-of-indigenous-peoples.html, consulted on 04/06/2021.

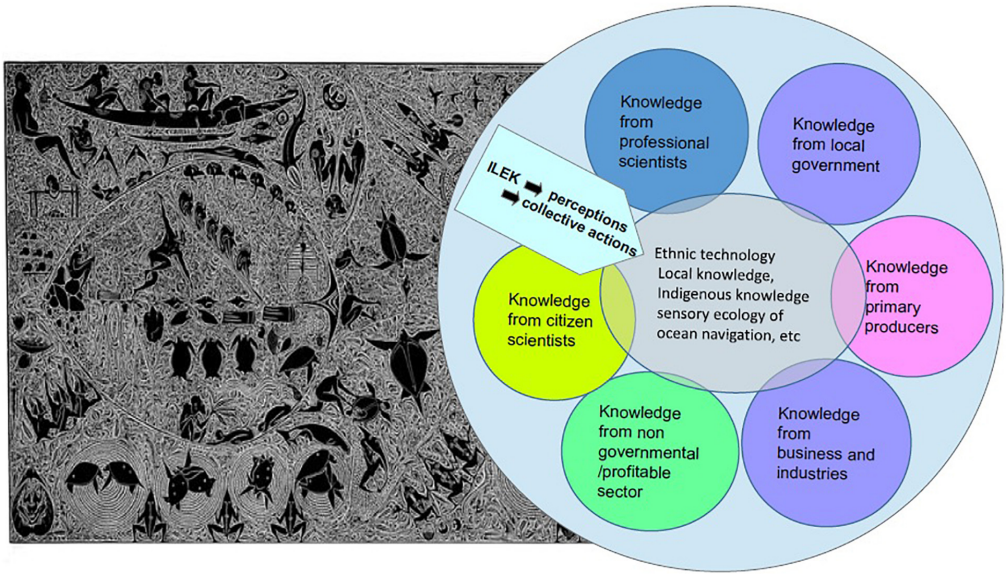

FIGURE 1 | Different perspectives of marine resource management in the Pacific Island States involving the concept of Integrated Local Environment Knowledge (ILEK). In the background, a linocut, "Wadth, Zigin Ar Kusikus," made in 2005 by Alick Tipoti, an artist from Badu Island in the Torres Strait. © Alick Tipoti/www.artsdaustralie.com. It depicts an interpretation of the cycles of life at sea and the multi-faceted network between living species, humans, non-human entities and nature. On the right side, a conceptual diagram modified from Sato (2014) representing ILEK, integrating all stakeholders' knowledge leading to perceptions and collective actions, a process used for adaptive societal transformation and social learning to achieve sustainable resource management.

stakeholders are harder to define (Warner, 2014) and mutual consistency in terms of rules and policies more difficult to obtain. Therefore, DSM is not only a site of empirical novelty (Petterson, 2008), it also invites a conceptual reconsideration of the ways in which the geographies and practices of resource extraction interact with the terms of the "social" (Childs, 2019) and "ecological" traditions of Pacific Island States and communities. This tradition is visible, for instance, in their effective implementation of sustainable-use governance over easily over-exploitable migratory species as Parties to the Nauru Agreement (PNA)[3] (Aqorau et al., 2018).

From a social standpoint, DSM is different to terrestrial mining: without land owners, it is much more difficult to define impacts and their spatio-temporal scales (Childs, 2019). From an ecological standpoint, there is a connectivity between Pacific Small Island Developing States (P-SIDS) relying heavily on marine resources through, *inter alia*, circulation of currents and oceanic properties and migration of species, e.g., highly migratory fish and mammals (Garcia and Doulman, 2005; Gillett et al., 2018; Popova et al., 2019).

From a mutual standpoint, an approach that is too fragmented, by marine areas, type of activities, etc., or an approach that is too reductionist, conceiving of environmental impacts in a foreseeable spatial or temporal relationship, might seem arduous to reconcile with the tradition of Pacific States and communities as well as with integrated approaches to environmental management (Vierros et al., 2020).

Regional cooperation has been the response to "ocean grabbing" where vast expanses of pelagic and seabed ocean spaces were largely unpoliced and exploited (Bennett et al., 2015; Silver et al., 2015; Le Meur et al., 2018). The first large-scale, no-take marine protected areas (MPAs) and sanctuaries, targeting highly migratory pelagic fish and marine mammals, were created in the mid-2000s and developed into a large network in the region (Jeudy de Grissac, 2003; Govan et al., 2009; Bambridge and D'Arcy, 2014; Tilot et al., 2021b) including « Locally Managed Marine Areas (LMMAs) » with strong socio-ecological benefits in particular for biodiversity conservation, fisheries management, livelihood diversification, and climate change adaptation (Ruru, 2008; D' Arcy, 2009; Jeudy de Grissac, 2015).

The Strategic Plan for Biodiversity of this network presently includes the Aichi Biodiversity Targets.[4] These targets have supported the design of the Sustainable Development Goals (SDGs)[5] adopted by the UN General Assembly (UNGA, 2015). The "Framework for a Pacific Oceanscape," endorsed in 2010 by the Pacific Islands Forum leaders, is the largest ocean governance initiative of the planet, over 38.5 million km^2, emphasizing integrated ocean management across all sectors to ensure good governance (UNEP, 2010; Bourrel et al., 2018).

[3]The subregional Pacific Nauru Agreement concerning cooperation in the management of fisheries common stocks (PNA) has been signed by eight Pacific Countries in 1982 and entered into force the same year. The management measures it establishes have been specified by 3 implementing arrangements and later endorsed by the Western and Central Pacific Fisheries Commission which includes all distant-water fishing nation fleets (South et al., 2004).

[4]CBD, 2010, Decision X/2 of the Tenth meeting of the Conference of the Parties to the Convention on Biological Diversity. 18–29 October, 2010, Nagoya, Aichi Prefecture, Japan. Par. 14.

[5]The SDGs 14 and16 encourage ocean sustainable management and its governance to include traditional and customary institutions.

Concerning DSM, the Pacific Island States, supported by the EU, cooperated to develop a contemporary Regional Legislative and Regulatory Framework (RLRF) for deep sea minerals exploration and exploitation (SPC, 2012) which serves as a roadmap to guide policy-makers and government agencies of Pacific Island States toward effective legislation and adequate decision-making for the long-term benefit of island communities and future generations. Environmental protection, responsible management of resources and due regard for social impacts are clearly emphasized, in particular traditional rights over resources, marine species (e.g., migratory species) and spaces (e.g., "tabu" areas).

In the perspective of changing socio-ecological systems, DSM has a wide range of identified environmental and climate related impacts, such as a reduction of primary production and carbon export to the deep sea (Levin et al., 2020). Furthermore, one must consider cumulative impacts, which are presently getting worse (Pacific Community, 2012; IPCC SROCC, 2019), within the water column and the seabed, with IPCC's extreme weather events and anthropogenic disturbances generally resulting in degradation and homogenization of habitats across broad tri-dimensional areas (Glover and Smith, 2003; Thiel, 2003; Smith et al., 2008; Galaz et al., 2012; Levin et al., 2016; Miller et al., 2018; Tilot, 2019).

Besides threatening marine ecosystem integrity, climate change negative impacts on the Ocean question States' territorial integrity (Maas and Carius, 2012; Hoegh-Guldberg and Poloczanska, 2017; Allen, 2018; IPCC SROCC, 2019) and might affect DSM planning in a near future. "Shifting baselines" (Orellana, 2015) may result in modifications of the marine spaces of archipelagic States (territorial sea, contiguous zone, archipelagic waters, EEZ, and continental shelf) while also entailing other issues such as the loss of statehood, internal, and external population migration, climate or environmental refugees (Burkett, 2011; Van der Geest et al., 2020) and threats to peace (Von Schorlemer and Maus, 2014).

Thus the mutual reinforcement between climate, biodiversity and ocean legal and political frameworks at international, regional and national levels implies fostering regime interactions across the various stages of law-making, implementation and dispute settlement (Gattuso et al., 2018; Guilloux, 2020) and pragmatic solutions for ocean health and wealth that support the SDGs (Hoegh-Guldberg et al., 2019). For example, the Convention on Biological Diversity (CBD) could be interpreted as involving Indigenous Peoples and local communities in climate-change-related decision-making (Morgera and Tsioumani, 2011).

TRADITIONAL AND SCIENCE-BASED MANAGEMENT TOOLS FOR THE MARINE RESOURCES OF THE PACIFIC ISLAND STATES

Even if indicators are presently linked to the SDGs, they have mostly been developed within the Western scientific paradigm and largely reflect the traditional siloes of economic, social and environmental issues, very far from the holistic world-view of many Indigenous peoples, in particular, in the Pacific Island States where traditional practices integrate human benefit and environmental well-being through various socially embedded management techniques (Dahl, 2011). Such global measures as the Human Well-being and Sustainable Livelihood (HWSL)[6] indicator would be well adapted, in this case, to determine the effectiveness of policy measures in resource management (Dahl, 2012; Sterling et al., 2020; Vanuatu National Statistics Office, 2021).

Work on indicators is only recently extending beyond the Western statistical framework and world-view to become more systemic and inclusive, and involving local people directly in indicator design (Duxbury and Gillette, 2007). Even the Vanuatu well-being indicators (Vanuatu National Statistics Office, 2021) measure only knowledge of traditional practices and not their content or impact. The case studies assembled in Sterling et al. (2017) include several examples of socio-ecological indicators developed directly at the community level in the Pacific Islands and elsewhere, and one approach incorporating a Maori world-view of the complete unity of people and the natural world, based on interconnectedness, extended time periods, and intergenerational equity, that would be relevant to assessing islanders' connections to the ocean realm near and far. All indicators in these studies have proven to support community decision-making while providing information to policy makers in different contexts, in particular on how local communities contribute to the maintenance of biological diversity and on the ecosystems' ability to respond to stresses and global change.

On basis of such indicators, one could establish a standardized method that would cover social/cultural, economic, political/governance, and environmental perspectives providing a more complex view of well-being than traditional metrics on Gross Domestic Products (GDP), which often drive policies promoting material progress over a less tangible « well-being » concept.

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), has gone the furthest in incorporating Indigenous and Local Knowledge because of its importance in biodiversity conservation[7] and having developed biocultural indicators (Dacks et al., 2019).

A holistic view of the environment is a first step toward reconciling traditional and scientific perspectives. This view corresponds also to one of the Ecosystem based Management (EBM)'s core principles—the interconnectivity between and within terrestrial and marine ecosystems. From a local perspective, the systematic articulation of local ecological knowledge and cultural values through the natural (e.g., marine science) and social (e.g., anthropology) sciences can better promote local participation in the design and implementation of environmental management and produce a more inclusive, transdisciplinary, approach to conservation

[6]HWSL is defined as the social, spiritual, cultural and traditional characteristics and the capabilities, tangible assets and means of living that set the stage for sustainability, resilience, and adaptability of people to change collectively (WCED, 1987; Millenium Ecosystem Assessment, 2005; Holden et al., 2014).

[7]https://ipbes.net/indigenous-local-knowledge (accessed July, 30, 2021).

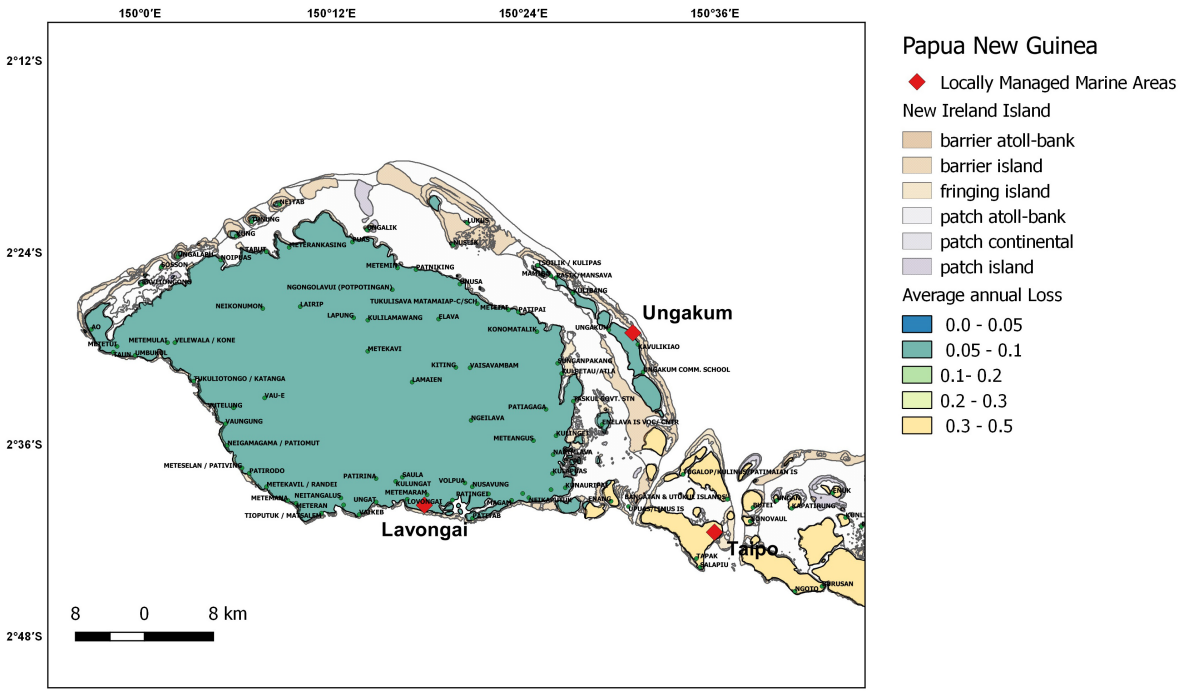

FIGURE 2 | This map illustrates the capacities of Geographic Information System Mapping (GIS) to enable the risk assessment of an area, in western New Ireland Island, PNG, located in the Bismarck Sea (Tilot et al., in progress). The area is assessed as socio-economically and environmentally vulnerable. The geo-positioning of different layers of information corroborates the location of small indigenous villages, the sites of Locally Managed Marine Areas (LMMAs), the types of coral reefs habitats and bathymetry and the economic impact assessment due to natural hazards through an Average Annual Loss (Andréfouët et al., 2006; PacGeo, 2020). Map designed with Geospatial data sets obtained from open access geospatial data repositories from the Millennium Coral Reef Mapping Project,(Data from a global coral reef database that was released by the United Nations Environmental Program World Conservation Monitoring Center (UNEP-WCMC). It was created from multiple sources, including USF's Millennium Coral Reef Mapping Project Seascape database and merged together by UNEP-WCMC and the WorldFish Center in collaboration with the World Resources Institute (WRI) and The Nature Conservancy (TNC).) the Institut de Recherche pour le Développement (IRD/Center de Nouméa), the geospatial data repository for the Pacific Region (PacGeo, 2020), the online GIS databases of the World Wildlife Fund (WWF) and the Coral Triangle Atlas.

(Bennett et al., 2017; Aswani, 2020). The socio-ecological monitoring tool proved to be effective in the Pacific region is the EBM tool (Bambridge, 2016; Sanborn and Jung, 2021). It could be adapted to assess impacts of DSM to Pacific Nation Islands in a holistic approach.

An "Indigenous hierarchical cognition of the seascape" has been designed by a mix of ethnographic, geographic, economic, and marine science research methods using *Geographic Information System* (GIS) for the Pacific Islands (Aswani, 2011). To illustrate this in **Figure 2**, we developed a baseline GIS model for DSM risk assessment (Tilot et al., in progress) applied to an area on the western New Ireland island in the Bismarck sea proximate to the Solwara deep Sea Mining project in PNG (Nautilus Mineral Inc, 2008; Filer and Gabriel, 2016).

The preliminary results show that the area is assessed as vulnerable socio-economically and environmentally, in particular climate wise with severe natural events (Asian Development Bank (ADB), 2009; UNDP/CCDA, UN house PNG, 2017; Tilot et al., in progress) (**Figure 2**). It would therefore be more sensitive to impact from proximate DSM projects. Further steps would require a risk assessment of the whole region including marine environment (coastal and deep environment) and biodiversity, socio-economic considerations (in particular ecosystem services), health and safety, natural and cultural human heritage (Cormier and Londsdale, 2020; Tilot et al., in progress).

DISCUSSION

A New Transdisciplinary Approach for Developing a Sustainability Index Adapted to Deep Sea Mining

When discussing the relevance, from different legal, environmental, anthropological, social, political and economic science perspectives of a « sustainability index » for DSM, one would have to assess the interconnectivity between biodiversity, ecosystems and local communities and their HWSL. This new transdisciplinary index would inform decision-making for the sustainable use and conservation of marine resources and services and ensure that marine benefits are realized in a holistic, sustainable and equitable manner as fostered by contemporary ocean governance, in particular concerning DSM in the Pacific. This would improve the science-policy-society interface for enabling and improving ongoing efforts to understand the role of economic, social, cultural, and political norms and values in ocean governance as well as to sustain HWSL of the Pacific

communities and the health of the Global Ocean (Claudet et al., 2020; Halpern, 2020). It could also serve to improve ocean literacy. Moreover, this index would integrate human, cultural and traditional behavior in decision-making into local, regional and global models, and should promote increased transparency and public participation.

The Relevance of the Concept of "Oceanian Sovereignty" in the Context of Deep Sea Mining in the Pacific

While Hau'ofa's concept of "Oceanian Sovereignty" conveys rights distinct from those granted by Island States and the international agreements and institutions which they establish, sensitive engagement with this community-and-region-grounded sovereign governance should be accommodated as supporting the responsibilities or even duties of all individuals, communities, as well as the States and agencies engaged in DSM in the Pacific. A vision of "Oceanian Sovereignty" implies the presence of the past and a history of prior linked historical environmental and social traumas and the responsibility to acknowledge and respond to them. This can be enhanced by recognizing generations of guardianship within the region's communities as ongoing and active, which, in turn, may better support the possibility of DSM actors and institutions being recognized by local communities.

The concept of "Oceanian Sovereignty" suggests therefore that governance or management action should be perceived, conceived, and engaged as a common enactment between partners which may overlap with but not be defined by the national or international governance framework whose agents and agencies are seeking to enact DSM. One of the most delicate issues confronting any governance or management context is the establishment of who can determine environmental and ecological futures and make decisions (Mawyer and Jacka, 2018). Thus, "Oceanian Sovereignty" implies that DSM actors should recognize, acknowledge, and develop policies, governance and management, and practices which express this reciprocal relationship central to their commitment to environmental protection and social justice toward ecological futures for the region and its marine spaces and resources.

The monitoring of resource exploitation activities across the Pacific cannot be done without the cooperation of the so-called great powers involved in fisheries in the region (notably the United States, New Zealand, Australia, and France) and the exploration and exploitation of seabed resources beyond national jurisdiction managed by the International Seabed Authority (ISA). The challenge is to allow a transparent flow of governance authority including the information necessary for policy determinations to local and regional stakeholders who share in "Oceanian Sovereignty." Environmental conservation action is thus one of the arguments and tools that can be used to assert geostrategic interests and "Oceanian Sovereignty" within a much larger set of diplomatic and legal instruments (Leenhardt et al., 2013; Giron, 2016; Heiduk and Wacker, 2020).

The future of DSM initiatives in the region would do well to similarly recognize, acknowledge, and engage with the dynamic presence of "Oceanian Sovereignty" as they seek to assess and understand the potentials and possible impacts of DSM on Pacific Nation Islands in a holistic approach. In this sense, DSM can contribute to socio-ecological problem shifting as does environmental management and conservation (Aswani, 2011; Schoon and Van der Leeuw, 2015; Virapongse et al., 2016).

It appears clear that Oceanian States need robust laws to govern key marine environmental issues (biodiversity conservation, marine bio-prospection, coastal and deep sea mining, ocean acidification, climate change, pollutions and their impacts). After all, international treaties are not always effective and can in various situations not be applied, while regional conventions mainly provide guidelines for States on how to develop suitable legal frameworks and thus do not typically constitute binding instruments by themselves (Tilot et al., 2021a).

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

VT worked on the structure of the article and developed with all authors a transdisciplinary approach for assessing and monitoring the future impact of DSM with a newly adapted sustainability index. EK gave a political and economical perspective to DSM. BG worked on the legal aspects and the socio-ecological dimension, in particular the impact of climate change. CM and KW worked on the legal aspects at all levels in the Pacific region and ocean governance. CM also contributed to the traditional perspectives of Micronesian Pacific Islands. FG, TB, PD'A, and AM contributed to the traditional and cultural perspectives in area and resource-based management in the Pacific Islands, in particular in Polynesia. AG contributed to ocean governance and ecosystem-based management, marine protected areas, and conservation. JN performed modeling and GIS mapping of a risk assessment of DSM in a pilot study in the Bismark sea assessing the socio-economical and environmental vulnerability. AD contributed in particular to the proposition of socio-ecological indicators integrating traditional knowledge and practices in a sustainability perspective that would better be adapted to future DSM in the Pacific region.

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