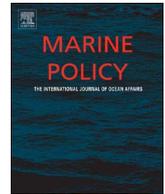




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# Restoring near-shore marine ecosystems to enhance climate security for island ocean states: Aligning international processes and local practices

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## ABSTRACT

This article contributes to a special issue examining SDG 14 and other international policy instruments for effective implementation of the Goal. This article focuses on island ocean states (IOS), or 'small island developing states' (SIDS), which are characterized by limited land and oceanic remoteness, creating local and international dependencies for food, livelihoods, trade and transport. While IOS contribute less than 1% to global green-house gases, they are directly impacted by extreme weather and climate change, in particular sea level rise. Near-shore marine ecosystems (mangroves, seagrasses and coral reefs) provide critical coastal protection and other benefits (e.g. fisheries), yet continue to be degraded from coastal development. Given their importance, restoration is needed where ecosystem function has declined, in concert with conservation of healthy sites. The overall restoration goals for IOS are to: i) enhance ecological integrity, ii) inspire local capacity building, and iii) accelerate climate change adaptation. This article examines the scope for such restoration through the UN SDGs, the Biodiversity Convention, the UN Framework Convention on Climate Change, and the Paris Agreement. Practical considerations of near-shore restoration are reviewed, emphasizing local and traditional knowledge regarding past and future perspectives. The article concludes with policy recommendations to integrate near-shore marine restoration across climate adaptation, conservation and planning processes to achieve synergies in effectiveness, essential to IOS settings. The UN SDGs provide a timely platform for IOS to align international processes with local needs to address their own goals in balancing population growth, economic development, food security and climate security.

## 1. Introduction

Small Island Developing States (SIDS) are considered a globally distinct collection of island nations characterized by their limited land area and oceanic remoteness. The UN formally identifies 37 tropical island countries and 20 affiliated entities as SIDS, spanning the Atlantic, Pacific and Indian Oceans, and the Caribbean, Mediterranean and South China Seas [1]. In recognition of the challenges and opportunities SIDS share, the Barbados Programme of Action (BPOA) was adopted in 1992 to provide a high-level platform for SIDS to more strategically engage from a collective position. This profile for SIDS continues to be embraced through various international processes today, e.g. the Convention on Biological Diversity (CBD) and most recently the UN Sustainable Development Goals (SDGs). Key processes include: the 2005 *Mauritius Strategy of Implementation* (MSI), the 2014 *SIDS Accelerated Modalities of Action (SAMOA Pathway)*, recognition of SIDS in the 2012 *UN Rio + 20 Future We Want*, and the 2030 *Agenda for Sustainable Development* [2].

From a biogeographic perspective SIDS range from 'high' active volcanic islands, to low-lying oceanic atolls which result from volcanic subsidence over millennia [3]. For some high islands and atoll states, the ocean area and exclusive economic zones (EEZ) can be considerably greater than the land area. For example, the Republic of Kiribati has the 13th largest EEZ in the world, and Tuvalu's EEZ is 27,000 times larger than its land area [4]. For such nations, the term 'large ocean island states' (LOIS) is also being used, reflecting their vast sovereign ocean space as well as emerging ocean-based economies, also known as 'blue growth' [5]. Recent scholarship on the international prominence of SIDS suggests the momentum for the ocean-focused SDG 14 was in part driven by the Pacific island nations [6], reflecting their shared opportunities and challenges, as well as climate change. In this paper, the term 'island ocean states' (IOS) is used as more geographically inclusive and in recognition that some SIDS are no longer considered developing states.

While IOS are diverse physically and culturally, their predominately oceanic geographies require innovative approaches to be economically

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competitive with larger land-based regions. Most IOS have small populations concentrated in capital centers, limited local food resources, a reliance on fishery and tourism sectors, high transportation and communication costs, and dependencies upon international trade and economic trends [7]. IOS can also be viewed as microcosms of 'social ecological systems', where the interplay of internal and external dynamics is highly coupled, with the pace and impact of economic and environmental change and societal responses concentrated in space and time [8,9]. This intensity of environmental and social pressures can result in island nations being considered more at risk to economic and climatic events, resulting in debates around their resilience, in particular with regard to food security, economic security, population growth, and climate security [10].

Traditional development theory has framed IOS as vulnerable in light of their socio-economic inter-dependencies. However, this is being re-examined with views that strong socio-cultural ties and regional leadership can foster innovative economic opportunities, inspire local capacity and contribute towards greater resilience to both economic and climatic challenges [11,12]. With regard to economic opportunities, advances in ocean-based technologies and blue growth (e.g. marine renewable energy, aquaculture and fisheries) are contributing towards shifting power dynamics and greater economic benefits for island nations [5,7,13,14]. One example is the 2010 Nauru Agreement (NA) for regional management of tuna stocks by eight Pacific island nations [15]. In recent decades, large marine areas were leased to foreign states for fishing with limited direct revenue flow to island states. The NA now restricts fishing of inshore waters to only national fleets. However, as most IOS have limited capacity to fish their offshore areas, foreign fishing license agreements are still useful, and through the NA are now structured to ensure resource rents flow directly to IOS, contributing to their economic development [16]. Interestingly, many of the same ocean-based technologies and economies that underpin blue growth, are also catalyzing support for large-scale marine protected areas within the EEZs of IOS, focusing on deep sea marine biodiversity and migratory species protection [17,18].

As these advances in ocean knowledge, blue growth and conservation foster more robust IOS economies, impacts from climate change remain paramount in both the short and long-term. Small islands contribute less than 1% to global green-house gases, yet they are on the front lines of diverse climate change impacts, ranging from: sea level rise (SLR), ocean acidification, species range shifts, increasing air and sea-surface temperatures, and extreme weather events [3]. Given most IOS societies reside and depend upon the coastal margins of their islands, it is critical that near-shore marine ecosystems be of sufficient scale, biophysical health and integrity to provide physical protection from storms, waves and SLR. Mangroves, seagrasses and coral reefs are near-shore marine ecosystems which dominate the coasts of most tropical islands. The dense root systems and reef frameworks of these ecosystems provide a range of services, including fisheries, fuelwood, carbon sequestration, biodiversity and tourism [19]. However, of these services, coastal protection is one of the most immediate and tangible [20]. In spite of the diverse services these near-shore marine ecosystems provide, they have been dramatically altered over time and remain highly threatened from direct and indirect impacts: including deforestation, dredging and filling for coastal development, shrimp farming, over-fishing and pollution from land and sea [21,22].

Replacement of the physical and coastal protective functions of mangrove, seagrass and coral reef ecosystems through engineered, hard-infrastructure solutions is costly and can result in a loss of ecosystem diversity and complexity that can compromise other services and co-benefits, e.g. fisheries and biodiversity. Management strategies, including marine protected areas (MPAs), coastal zone management (CZM) and marine spatial planning (MSP), remain an essential first priority for the protection of these ecosystems and attempts to balance conservation and development. However, in light of IOS development pressures and climate change impacts, both in the past and future, there

is also a critical need to consider the restoration of degraded mangroves, seagrasses and coral reefs as a critical component of both conservation and development strategies.

This paper contributes to a special issue of Marine Policy exploring synergies across the SDGs, focusing on SDG Goal 14, and its relationship to broader policy, legal instruments for more holistic and effective interpretation of this Goal [23]. The special issue is part of an interdisciplinary research project examining global to local legal approaches to marine ecosystem services for poverty alleviation [24]. Articles in this issue examining SDG 14 perspectives that are most relevant to this paper on SIDS, include: co-benefits and trade-offs with other SDGs [25], marine spatial planning [26], marine protected areas [27], other area-based conservation measures [28] and technology transfer [29].

Noting the timeliness and relevance of SIDS to SDG 14, in particular target 14.7 on enhancing economic benefits to SIDS [2], the starting point for this paper is consideration of international policies from which SIDS (IOS) could optimize local capacities through the SDGs. As noted the recent analysis by Singh [25] on Goal 14 in relation to all SDGs, Target 14.7 has the highest positive alignment with all of the goals. This is not surprising given the inter-linkages that characterize IOS, yet this also highlights there are numerous ways to conceptually align SIDS, SDG 14 and other SDGs. Taking into account priorities emerging from recent SIDS processes (e.g. the SAMOA pathway) and the *Call to Action* from the 2017 UN Oceans Conference [30], this paper seeks to examine SIDS and SDG synergies which could achieve the following objectives in both the near and long-term: i) enhance ecological integrity, ii) inspire local capacity building, and iii) accelerate climate change adaptation.

This paper begins with a review of entry points in international policy to explore how near-shore marine ecosystem restoration is considered within the SDG goals, the Convention on Biodiversity (CBD), and the UN Framework on Climate Change (UNFCCC). We then draw upon academic literature and local examples of practice to consider how restoration of tropical near-shore marine ecosystems can contribute to climate change adaptation and security, in particular for low-lying islands. We conclude with recommendations and policy considerations to more effectively integrate IOS focused near-shore marine restoration into broader climate change adaptation and ecosystem conservation policies.

## 2. Near-shore marine restoration in SDGs and international processes

To examine to what degree IOS and near-shore marine restoration are profiled in strategic environment and climate processes, the following international conventions and policy plans were reviewed:

- UN Sustainable Development Goals, in particular SDGs: 13 (climate), 14 (oceans), 15 (land).
- CBD Aichi Targets and National Biodiversity Action Plans.
- UNFCCC National Climate Action Plans, and Intended Nationally Determined Contributions (INDCs).

These were selected as they highlight SIDS (IOS) from various perspectives and have mandates to address biodiversity loss and climate adaptation. Consideration of these conventions through a lens of IOS near-shore marine restoration, potentially provides a way to explore synergies which could result in more effective ecosystem-based action on the ground and joined-up engagement with local stakeholders and communities. For example, signatory commitments to the CBD and UNFCCC are typically responded to by national level ministries, yet the conventions and corresponding action plans may be compiled and managed through different agencies, including NGOs. In addition, a more in-depth look at CBD national biodiversity action plans, UNFCCC climate adaptation plans and UNFCCC INDCs are considered for two low-lying atoll nations (the Republic of Kiribati, and the Republic of the Maldives). These further explore alignment across international

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