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Need for the Scuba Diving Industry to Interface with Science and Policy: A Case of SIDS Blue Workforce

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Abstract: To achieve coral reef resilience under Agenda 2030, island governments need to institutionalise a competent blue workforce to expand their reef resilience initiatives across economic organisations and industries. The ability of island governments to shape new policies for sustainable island development relying on natural capital, such as coral reefs, has been hampered by structural and institutional deficiencies on both sides of the science-policy interface (SPI) at the UN. Using a qualitative research design, this article explores the science-policy interface (SPI) policy paper, Rebuilding Coral Reefs: A Decadal Grand Challenge and the role of this SPI in guiding UN coral reef financing for island states. This article uses the dive industry to investigate the needs of policymakers in island states via a conceptual framework for policy analysis. This article highlights the gaps of the SPI from the perspective of the global south and is beneficial for the islands selected under the Global Coral Reef Investment Plan. The article highlights the results of the SPI to island decision makers, which indicate that, without a policy framework that includes space for industrial policy within UN SPI, island governments will continue to fall into financial traps that constrain their efforts in operationalising their blue workforce. The study concludes that interlinked SDGs, such as SDG 9 and SDG 8, which focus on linking industrial innovation and infrastructure with decent work, as well as SDG 16 and 14.7, provide SIDS institutions with integrated policy approaches capable of bridging the divides between the scientific community, the diving industry, and island governments and that this needs to be further explored at all levels.



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Keywords: SIDS; global coral reef fund; SAMOA pathway; diving industry; science-policy interface; blue workforce

1. Introduction

In the UN development systems [1], Small Island Developing States (SIDS) governments seek their Official Development Assistance (ODA), including coral reef financing via negotiations and genuine partnership frameworks [2,3]. The guiding principles for ODA are set out in the conventions like Sendai framework for disaster risk reduction of 2015–2030, the Addis Ababa Action Agenda of financing for development of the UN, including the 2030 Agenda with its 17 Sustainable Development Goals (SDGs) and the Paris Agreement UN Framework Convention on Climate Change (UNFCCC) [4]. Under Agenda 2030, for example, SDG target 17.3 focuses on mobilising additional financial resources for developing countries from multiple sources. SDG indicator 17.3.1 monitors Foreign Direct Investment (FDI), Official Development Assistance (ODA) and South-South Cooperation (SSC) as a proportion of the total national budget. SDG target SDG 15.9 emphasises integrating ecosystem and biodiversity values in the planning and development processes, and target 15. as with indicator 15.a.1: (a) Official development assistance on conservation and sustainable use of biodiversity; and (b) revenue generated and finance mobilized from biodiversity-relevant economic instruments directly address increasing

financial resources to conserve terrestrial ecosystems. Additionally, SIDS climate and ocean financing decision-making processes are guided by the science-policy interface (SPI) at the UN, which directs the official development assistance or financial capital under which island governments' coral reef resilience building budgets are rolled out [5,6]. An example of the SPI in the UN system that has guided the ocean financing [7] landscape under Agenda 2030 is the Coral Bleaching Futures under the 50 Reefs model [8], influencing UN financing decisions for member states [9] using pilot reef sites established in six Pacific Island nations, [10,11]. Since the 1972 Conference on the Human Environment, various science-policy interfaces have been used in global environmental governance to inform investments, and their successes and limitations have been well established. Member states have highly criticised these limitations for their lack of relevancy within their national policy cycle [2,12,13]. Other examples and critical reviews of SPI at the UN informing SIDS development can be found in the 2015 global sustainable report [2] policy brief SPI from warning to the solutions [12]. A SIDS-specific Science–Policy Interface review called for changes in the governing processes [14,15] at the UN, as there are no distinct processes between the industrialised nations (global north) and non-industrialised (global south) (<http://sids-l.iisd.org/news/expert-group-meeting-discusses-science-policy-interface-in-SIDS/> accessed on 1 December 2022).

For many SIDS, their exclusive economic zone (EEZ) and coral reef hotspots for biodiversity are considered more significant than their terrestrial ecosystems [16]. SIDS, through their EEZs, control approximately 30 per cent of all oceans and seas [17], granting them a distinct position in framing the governance of policy integration with the political, economic, sociological, technological, and environmental contexts under Agenda 2030 as 'large ocean island states' [18,19]. SIDS first positioned the importance of integrating ocean protection into their economic development in the United Nations Conference on Sustainable Development held in Rio de Janeiro in 1992 (Agenda 21 –Chapter 17, Protection of The Oceans, All Kinds of Seas, Including Enclosed and Semi-enclosed Seas, and Coastal Areas and The Protection, Rational Use and Development of Their Living Resources) [20,21]. During the Rio process, SIDS failed to gain political support for institutionalising an integrated policy framework, Agenda 21, chapter [17,21], of the marine environment with economic development and industries [22,23]. Instead, the focus was on land-based environmental issues, guided by the limited scope of the SPI at the UN, which determined the mandate of national environment ministries in the islands [23]. Moreover, these ministries were hampered by government budget deficits and had weaker overall policy positions and cross-sectoral cooperation with other ministries, such as trade and commerce [24]. This approach prevented government-wide policy integration with the environment ministry, making it more difficult for island policymakers to institutionalise cross-sectorial institutions, ministries, and workforces [25]. Strengthening the permanent roles of islands' marine and coral reef diving workforces could help address cross-cutting issues regarding the rational use of coral reefs in the ministries of trade and industry [22,23]. Since the adoption of the Barbados Program of Action in 1999, SIDS have prioritised science, technology, and industry cooperation in all of their intergovernmental processes [2]. The 2005 Mauritius Strategy of Implementation (MSI) recognised that science and technology are cross-cutting issues for all sectors and emphasised the need for investment in science and technology capacity for small island developing states [26,27]. This begs the question as to why science, technology, infrastructure, and industry partnerships are not integrated within funding mechanism strategies for SIDS in the first place, e.g., in the financing model for rebuilding coral reefs, unlike the strategies employed by industrialised nations. This also draws attention to the UN-Environment Program's (UNEP) 2018 policy analysis of the design of the international coral reef instruments and policy landscape [28], which failed to address locally generated drivers [10], cooperation and policy coherence among UN agencies and ODA [13] sector silos [29] in SIDS case [30]. In the context of the SDG 13 pertaining to UNFCCC, there is growing evidence that climate action requires a transition that takes into account all dimensions of sustainability, including social, economic, and environmental

issues [31,32]. The intergovernmental SPI processes that guides ODA for ocean and climate finance and influence policy-making at the national level have been conspicuously reluctant to integrate social sustainability funding channels, particularly for the ILO's Decent Work Agenda, equipped with modern technology [25]. The neglected status of public sector workers involved in building coral reef resilience via marine park management [33] is highlighted in recent SIDS-specific case studies on the workforce for SDG 14 [29] and changes in the marine sector and industry [34]. In the era of the SDGs, policy guidance at the UN, here through the International Coral Reef Society (ICRS) spearheading the rebuilding coral reefs SPI [35] and UNEP policy guidance to SIDS [6], cannot be based solely on access to climate and ocean science for islands [36], nor solely on discussions guided by the limited scope of the science-policy interface expert groups [15,25]. Furthermore, the SPI discussion must not be dominated by western scientific approaches, such as those advocated by the Global North for coral reefs for island developing states or coastal states in the Global South [13,37]. Against this background, and using the example of the SIDS, referred to in this article as the Global South, island negotiators need to be aware of the political mechanisms parallel to the SDGs at the macro level, and this is where the gap in understanding the roles of the SDGs lie. This article addresses this gap and provides methods that island states can use to make a unified demand for an inclusive, equitable, and effective SPI at the UN that takes into account the synergies and trade-offs between climate, ocean, and industry.

The policy integration mechanisms for conservation and sustainable use of the oceans, seas, and marine resources for all users, including marine industries and the private sector, are now accorded among the 17 SDGs under Agenda 2030 [38–41]. Most importantly, under Sustainable Development Goal 14: Life Below Water (SDG 14), there is an explicit new target for SIDS public policy positionality within the UN system; SDG 14.7, among other targets, provides a direct link for island governments to explore synergies and address trade-offs with their ocean-dependent sectors and industries under their blue economic development strategies [41,42]. However, this goal has not been sufficiently promoted in the integration of the SDGs in terms of policy coherence, despite the fact that it has very high synergy effects with areas of the economy, trade, and climate policy [25,43].

From goal setting to the integrated implementation of SDG 14, island leaders, in partnership with high-level representatives of developed nations, agreed on a policy statement, adopted in 2017 as the Coral Reef Life Declaration, to guide ODA, in this case, the Global Fund for Coral Reefs, towards a climate-resilient development agenda [8,44]. This political declaration is underpinned by the interlinked nature of SDG 14 with other SDGs and within SDG14 targets, aimed at enhancing international and intergovernmental cooperation among the UN agencies in countering threats faced by oceans: (1) marine pollution, (2) unsustainable fishing practices, (3) loss of coastal and ocean habitat, (4) invasive species, and (5) effects of climate change [45]. Moving from global political commitments, at the national level, island governments require policy designs for institutionalising their workforces that can deliver effective mitigation from the effects of these five areas of damage done to oceans. As expressed in the UN Ocean Conference, there are voluntary commitments to support SDG 14 implementation, including SDG 14.7, addressing the special case of SIDS [45]. SDG 14.7 has high policy coherence and cross-sectorial cooperation and partnership potentials with strategic industries such as the global diving industry [41].

However, this is only weakly promoted in the ICRS-SPI for rebuilding coral reefs [32] under the special case of SIDS in the UN official development assistance funds (SDG 17.3) [46]. Additionally, to shift away from a silo and sector-based approach to development [31] impacting oceans negatively, several researchers have extended the urgent need for marine science-industry and government collaborations to drive the implementation of SDG 14, particularly involving coral reef policy [34,47,48]. Hence the additional question arises whether the ICRS-SPI for rebuilding coral reefs [35] process of the UN includes mechanisms for synergy building with industries and decision makers for technology and infrastructure investments needed to institutionalise the diving workforce. In addition, the ICRS-SPI for rebuilding coral reefs has not included the policy agenda and recommendations of island

dive professionals and coral reef scientific experts in its funding models, which includes understanding how the diving industry works with island governments.

The diving industry and labour force in the Global North have historically been used primarily for ship salvage and military operations under the national security ministries [49,50]. The SIDS diving workforce and dive professions integrating marine science and economy serve both the maritime and marine sectors of the blue economy [41], supporting coral reef value chains in both tourism and fisheries [51]. Since 1995, the work of Divers for the Environment, accredited by UNEP as an International Environmental Organization [52], has shown that island marine and dive professionals need strategic and policy-level relations with the dive industry. The status of the island workforce for SDG 14 and the necessary role of diving and marine authorities are now well established at the macro level under SDG 8 and SDG 14 interlinkages and the ILO Decent Work Agenda [25,41]. However, the issues regarding these workforces remain underrepresented and silent under the UNFCCC or Paris Agreement, particularly within coral reef financing models in UN development systems. While the economic contributions from scuba diving centres frequently get used in ICRS-SPI for rebuilding coral reefs in the UN financing models [18,19], governance and institutional mechanisms allowing the diving industry stakeholders to play a strategic role in policy making have lagged [25]. This leads to persistent financial bottlenecks in national strategies to retrain and upskill the labour force, which requires adequate technology and infrastructure to implement the SDGs.

Policymakers in SIDS are in the process of localising their key interlinked sustainable development priorities agreed upon internationally with developed countries and at the national level under their Coral Reef Declaration [25,41]. The 2022 International Coral Reef Symposium led the first series of science-policy dialogues after COVID-19 with the launch of the SPI document titled Rebuilding Coral Reefs: A Decadal Grand Challenge [35], thereby providing this study with an opportunity to examine SPI at the UN specific to the SIDS case, specifically SDG 14.7. This article assesses the SPI at the UN with particular attention to the nature of policy guidance for mobilising climate finance and official development assistance (ODA) through the synergistic nature of SDG 14.7, which is linked to science, technology and infrastructure, and industry under trade and economy. The policy-level recommendations (Section 4.2: Policy relevant recommendations and decision tree for considering options to leverage international policy for increased conservation and management of coral reef ecosystems) from the 2019 UNEP Global Coral Reef Policy Analysis Report were reviewed [6] using the conceptual framework outlined in Section 2.0 to gather insights on the types of policy recommendations provided to island governments. This article provides a special and timely contribution and opportunity for island policymakers to link their high-priority SDGs with coral reef-dependent marine industries SDG 9, with SDG 8–International Labor Organisation decent work agenda, and SDG 14. This study is aimed at island policymakers and their ODA development partners to stimulate further discussions at the UN concerning the UNEP global coral reef governance structures and ocean financing models to broaden the scope in specific cases of island nations pioneering blue economies [53,54]. The findings of this study will help to raise awareness of SDG 14.7, which has a high potential for synergy to support multiple policy goals, such as SDG 13, Climate Action, and the SIDS Technical Assistance Strategy (2019–2025) for industrial policy in a coordinated manner and to minimise trade-offs.

2. Study Conceptual Framework, Materials, and Methods

This section outlines the conceptual framework, materials, and methods that link the two phases of this study, the conceptual framework in 2.1., which later guides the choice of materials and methods in 2.2. The thematic area of the 2022 15th ICRS Science-to-Policy that this article relates to is: Section 12L, What are the challenges, solutions, and synergies at the interface of science and policy to successfully conserve coral reefs? <https://www.icrs2022.de/program/sessions-themes#c244> accessed on 1 January 2022. The background information on the development of the SPI policy papers and dialogue, which

is the subject of this paper, can be found at <https://www.icrs2022.de/scientific-program/science-to-policy-dialogue> accessed on 20 August 2022. The study uses the dive industry as a strategic partner of focus in the case of the islands dive workforce, where the search for strategic policy actors is applied using the concept of keystone actors and industries [39].

2.1. Conceptual Framework

In the SDG era, island policymakers have new means and tools to steer the coordination of wider stakeholders in terms of strategic policy advice, whereby official development assistance (SDG 17.3) and investments for sustainable development can be directed where they are needed the most [10,55]. To date, quantitative and mixed qualitative and quantitative research studies have been conducted to understand the successes and challenges of the science-to-policy process guiding the ODA processes at the UN for developing states [12,15,56]. This study uses qualitative research [57] design first to understand the SPI processes at the UN that drive global policy decisions [58] to rebuild coral reefs under official development assistance (ODA) and other funding models specific to the SIDS case. Under the qualitative research design, a case study research approach is applied [59] to explore the SDG synergies approach [60,61] in the context of SIDS and SDG 14.7, as opposed to the global context of SDG 14. How interactions and synergies between the SDGs play out depends on the context [62] and focusing on a specific SDG target helps to simplify the complexity of dealing with a large number of SDG interactions and captures how progress on one SDG or target can affect the progress on a wide range of SDGs and related actions [61]. The SDG policy framework study design is based on a methodological approach developed by the Stockholm Environment Institute (SEI) [43]. The policy analysis conceptual framework at multiple levels [58] (see Figure 1) guided the literature review, the construct of relevant key macro-level policy evaluation, and the content analysis of SPI expert guidance. The conceptual model, Figure 1, also guides the SDG's data collection, screening, and validation processes in the specific context of a SIDS government, here studied via content analysis and interpretation [57]. Figure 2 provides the SDG accelerator ABA assessment tool which supports the evaluation of SDG synergies and trade-offs in the national and local contexts. See a similar methodological research approach in the case of SIDS for SDG synergies and trade-offs in other studies [25], SIDS debt restructuring under ocean and climate finance [63].

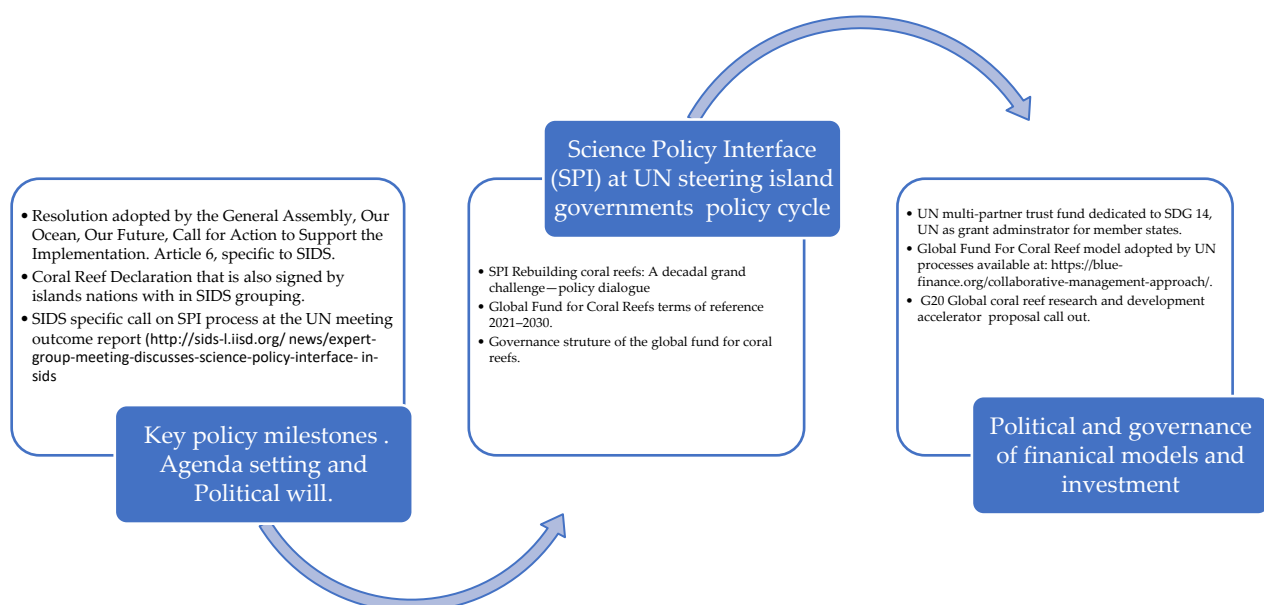


Figure 1. Conceptual framework to study the steering effect of the ICRS SPI Rebuilding Coral Reefs: A Decadal Grand Challenge in island nations ocean financing policy cycles and decision making, designed by the author.

2.2. Methods and Materials

SIDS Context in the Global Coral Reef Investments. The key policy milestones in which SIDS leaders played an active role were selected as macro-level policy documents and listed in Figure 1. The macro policy documents were analysed in terms of political, economic, sociological, technological, and environmental contexts by conducting a content analysis search of “science-policy-industry partnerships” for SDG 14. The search was based on a literature review, particularly with reference to the 2019 UNEP policy recommendations [6], the 2022 ICRS SPI Rebuilding Coral Reefs: A Decadal Grand Challenge (in discussing the findings of SPI, the author has italicised the name of the document here: *Rebuilding Coral Reefs: A Decadal Grand Challenge*, to refer to the specific policy guidance in that document, particularly in Section 6, which discusses the policy landscape for coral reefs, found here https://coralreefs.org/publications/rebuilding_coral_reefs/ accessed on 20 August 2022) [35], and lessons from the 50 years of the UN’s policy-making for sustainable development, [12], which confirms that more than 230 international agreements with provisions regarding the protection of coral reefs have thus far failed to protect coral reefs in the UN development systems [6,12]. Against this failure, the resolution entitled “Oceans, Our Future: A Call to Action” adopted by the General Assembly, heads of state and government, and high-level officials provides additional key material to study the SIDS case. The resolution endorsed the urgent need for a broad participation in SPI at the UN by civil society, and relevant stakeholders, including the private sector and industry [64].

National level need for the global south. This study uses the UNDP SDG accelerator and bottleneck assessment tool (ABA) to identify the bottlenecks or governance traps [65] faced by islands using the policy materials listed above and illustrated in Figure 1. The study adopts the definition of a governance trap where a misdiagnosis of the problem constrains the ability of policymakers to address problems, and policy governance is hampered by the misrepresentation and miscalculation of actors and investment needs in resource allocation [29,37]. The ABA tool enables the assessment of interventions tailored to the specific context of the country and the different governance levels and stakeholder levels involved in the implementation of the interventions, as well as in planning and financing, as outlined in steps 1 to 4 in Figure 2. In addition, the ABA tool enables a focus on the development needs of the most marginalised groups under political reforms, and this study focuses on the diving industry labour force in the global south. Specific diving industry stakeholders that are being marginalised in the policy-level decision making [41] identified in this study include the leaders of artisanal diving communities, marine science divers, diving education agencies and networks, diving safety and education research institutes, diving schools, diving tourism centres, independent diving professionals, diving ambassadors for conservation, diving public safety officers, marine protected area rangers, diving clubs, diving media and public relations, hyperbaric chamber doctors and medical diving technicians, and the Divers Alert Network. The study considers these stakeholders as policy actors who are accelerators of SDG 14.7 in the SIDS case [41]. The ABA tool also incorporates the author’s observations from the ICRS science-policy dialogue attendance and helps validate the studies’ datasets. ABA provides an analysis that helps explore the catalytic policy and program areas or ‘accelerators’ that can trigger positive multiplier effects on the SDGs and targets, as well as solutions to bottlenecks that hinder the optimal implementation of interventions.

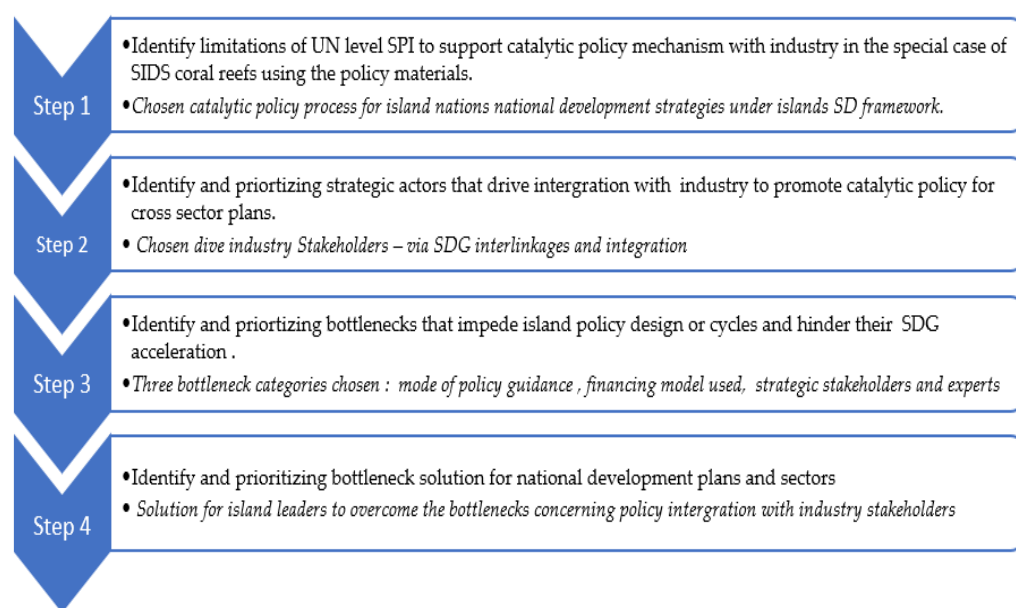


Figure 2. SDG accelerator ABA assessments tool [65] applied by the author [25] to identify gaps in SPI for rebuilding coral reefs [35] at the national and sector level.

3. Results

This section outlines the results by first placing the ICRS SPI Rebuilding Coral Reefs: A Decadal Challenge [35], within the SIDS macro policy framework, distinguishing island nations' policy priorities from those relating to developed nations.

3.1. SIDs Governance Regime Shifts Provide a New Institutional Outlook and Processes for Old Problems

In 2014, a list of integrated policies was adopted as the SIDS Accelerated Modalities of Action, also known as the SAMOA Pathway [62], to facilitate the achievement of sustainable development goals in the context of island nations, see Figure 3. At the global level, important progress was made in 2015 in multilateral efforts to address the world's most pressing problems with the adoption of the Paris Agreement UN (Framework Convention on Climate Change) and the 2030 Agenda with its 17 Sustainable Development Goals (SDGs). Like the 2030 Agenda with its 17 Sustainable Development Goals (SDGs), the SAMOA Pathway sets out a number of policy priorities, noting that small island developing states remain a special case under the official development funds [66].

The two international instruments, the SAMOA Pathway and Agenda 2030 and its associated SDGs, as illustrated in Figure 3, both aim to set out a range of policy directives in different areas that align SIDS priorities with global priorities. However, the SAMOA Pathway is more comprehensive as it addresses the development priority areas of SIDS and the least developing nations, while the SDGs are global in nature [2,17]. An example where the SAMOA Pathway is more comprehensive to SDG 14 is on oceans and seas (see Table 1). The policy analysis "From Decline to Recovery: A Rescue Package for the Global Ocean" addressed the macro-level policy proposals to the UN development systems [67] and provided the evidence base for islands' SAMOA Pathway oceans and sea policy framing that was later incorporated into the negotiated text of SDG 14 [67]. Through the SAMOA Pathway, SIDS have brought the adoption of the integration of environmental goals with their economic and social development to the forefront of their policy debates in the UN [66], which includes the governing process of SPI [14]. The SAMOA Pathway is a unique framework for SIDS built to meet their governance regime shifts in the face of climate change within the UN development systems and their national public policy reforms (see <https://sustainabledevelopment.un.org/sids/samoareview> accessed on 10 January 2020). The SAMOA Pathway review process has initiated SIDS-specific Science-

Policy Interface stakeholder dialogues held in St Lucia in March 2015 (<http://sids-l.iisd.org/news/expert-group-meeting-discusses-science-policy-interface-in-SIDS/> accessed on 15 January 2021). The consultation highlighted key challenges common to all SIDS regions, including the unpredictable funding for SIDS-owned initiatives, the movement of their skilled labour, and the failure of policymakers to harness work forces (<http://sids-l.iisd.org/news/expert-group-meeting-discusses-science-policy-interface-in-SIDS/> accessed on 1 January 2020). These macro policy levels have called for the international community to implement regime shifts in the overall ocean governance decision-making processes, including the SPI guiding finance model [9] and flow of investments (ODA) for coral reef rebuilding projects [64]. See a similar three-tiered macro policy approach reflecting island governments' political, governance, and contextual priorities in parallel with the interlinked SDG 8 with SDG 14 by the author in a SIDS blue economy [25]. Island advisors for policy designing at the national level have echoed these same needs; see commentary concerning the SPI that steered funding decisions for the 50 Reefs Initiative [10].

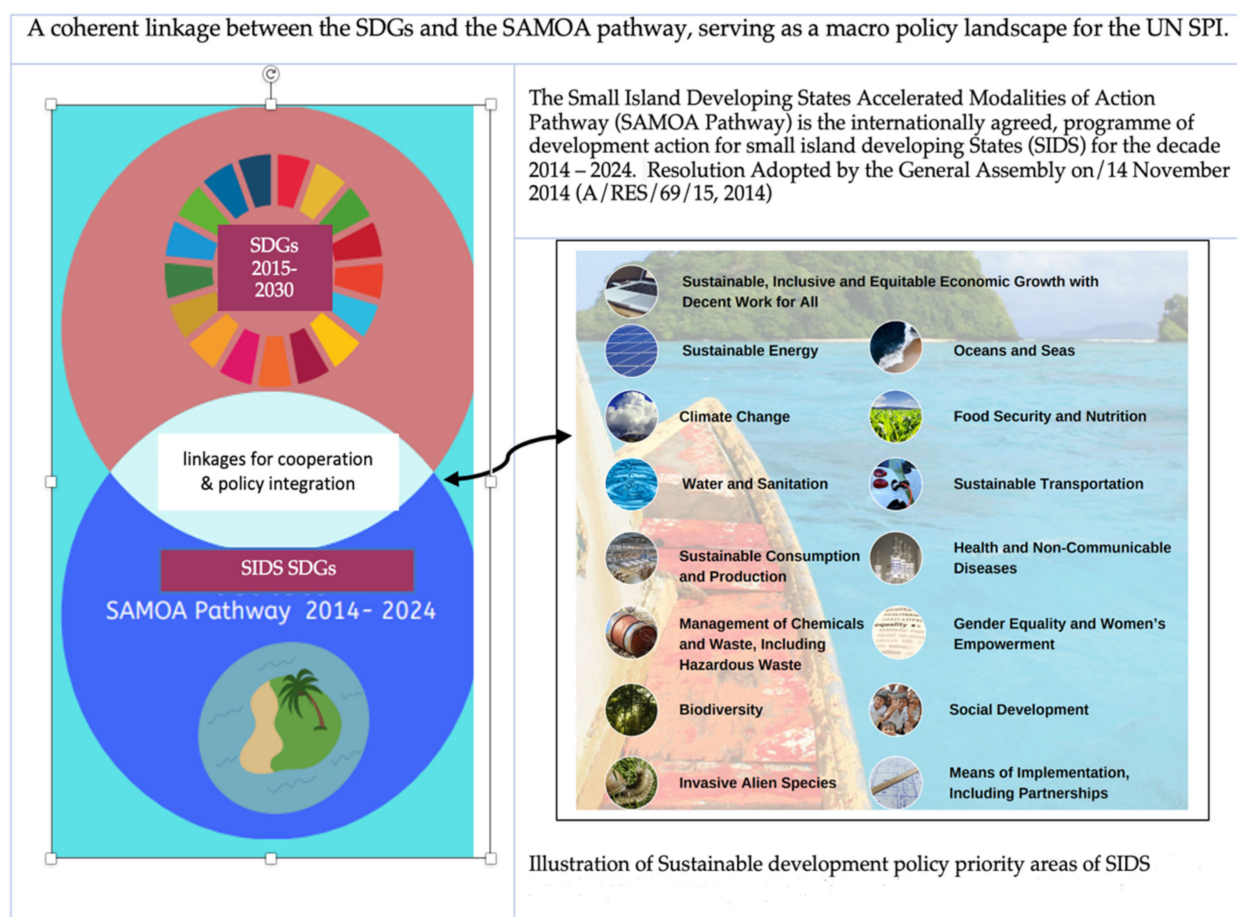


Figure 3. The macro policy framework provides a simple visualisation of a coherent link between the SDGs and the SIDS, Accelerated Modalities of Action (SAMOA Pathway), designed by the author. The SAMOA Pathway also highlights the SIDS policy priorities in comparison to the SDGs.

Table 1. Macro-level policy analysis of SIDS oceans and seas goals, articles a–p, juxtaposed with the correlating SDG 14-negotiated text. In particular, the highlights of the SDG 14.7 and 14.2 targets are parallel to SAMOA Pathway resolution, articles a, b, and e. See a similar analysis [25].

SAMOA Pathway: Oceans and Seas Policy Priorities in Parallel with SDG 14, Life Below Water.			
SIDS Oceans and Seas section Para 58 a–p SIDS Accelerated Modalities of Action (SAMOA) Pathway, Resolution Adopted by the General Assembly on/14 November 2014. A/RES/69/15, 2014)			Corresponding SDG 14 targets
a	Sustainably use the oceans, seas and their resources by supporting research and the implementation of strategies on coastal zone management and ecosystem-based management.	14.7	Sustainable use of marine resources, including through sustainable management of fisheries, aquaculture, and tourism.
b	Engage in national and regional efforts to sustainably develop the ocean resources of small island developing states and generate increasing returns for their peoples.	14.7	Increase the economic benefits to small island developing states and least developed countries from the sustainable use of marine resources.
c	Protection of regional seas	14.2	Sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience and acting for their restoration to achieve healthy and productive oceans.
d	Mitigate marine pollution	14.1	Prevent and significantly reduce marine pollution of all kinds from land-based activities, including marine debris and nutrient pollution.
e	To undertake urgent action to protect coral reefs and other vulnerable marine ecosystems through the development and implementation of comprehensive and integrated approaches for managing and enhancing their resilience to withstand pressures.	14.2	Sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience and acting for their restoration to achieve healthy and productive oceans.
f	Marine scientific research	14. a	Increase scientific knowledge, develop research capacity and transfer marine technology.
g	To enhance and implement the monitoring, control and surveillance of fishing vessels to effectively prevent, deter and eliminate illegal, unreported and unregulated fishing, including through institutional capacity-building at the appropriate levels.	14. a	transfer marine technology to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries,
h	To support the sustainable development of small-scale fisheries, improved mechanisms for resource assessment and management and enhanced facilities for fisheries workers, as well as initiatives that add value to outputs from small-scale fisheries and to enhance access.	14. b	Provide access for small-scale artisanal fishers to marine resources and markets.
i	Reform fishery subsidies	14.6	Prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, and eliminate subsidies that contribute to illegal, unreported, and unregulated fishing.
j	Protection of the Underwater Cultural Heritage		No correlating targets.
k	promote the conservation, sustainable use and management of straddling and highly migratory fish stocks, including through measures that benefit Small Island Developing States.	14.4	Effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans,

Table 1. Cont.

SAMOA Pathway: Oceans and Seas Policy Priorities in Parallel with SDG 14, Life Below Water.			
l	Enhance the capacity for SIDS to use their fisheries resources and develop fisheries-related industries, enabling them to maximise benefits from their fisheries resources and ensure that the burden of conservation and management of ocean resources is not disproportionately transferred to Small Island Developing States.	14.7	By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism.
m	Cooperation of the international community in implementing shared responsibilities under regional fisheries management organisations		No correlating targets.
N	Mitigate ocean acidification	14.3	Minimise and address the impacts of ocean acidification.
O	To protect 10 per cent of coastal and marine areas	14.5	By 2020, conserve at least 10 per cent of coastal and marine areas.
p	To prevent toxic waste disposal	14.1	By 2025, prevent and significantly reduce marine pollution of all kinds from land-based activities, including marine debris and nutrient pollution.

Extending from Figure 3, Table 1 outlines the parallel processes of the SAMOA Pathway oceans and seas goals with SDG 14. The SAMOA Pathway section “Oceans and Seas” was originally listed in 20 paragraphs of the Rio + 20 Final Declaration “The Future We Want” [68]; hence, it is more comprehensive in nature. The SDG “Oceans” was originally proposed by the Small Island Developing States when the Open Working Group on the SDGs started its work <http://sdg.iisd.org/commentary/guest-articles/sdg-at-sea/> accessed on 12 March 2020. Table 1 shows what now relates to SDG 14.7 as a direct outcome of SIDS’ political lead on formulating a policy directive on “Ocean and Seas as a policy priority goal” under the SAMOA Pathway. This section elaborates on SDG target 14.7, which provides synergetic linkages to trade and economic policies [40], integrated solutions, synergies, and trade-offs for the sectors and industries of the blue economy [41]. Following and complementing the resolutions of the SAMOA Pathway articles in Table 1, SDG 14.7 calls on the international community to expand the pathways for the sustainable use of marine resources to achieve greater economic benefits for SIDS. In particular, in ways that synergistically link the oceans and climate policies with the fisheries, aquaculture, and tourism sectors and industries by 2030 [16,69,70]. SDG 14.7 is a political agreement meeting the call of SIDS for an integrated policy-making mechanism [36] and new policy-making systems at all levels, including financing [25]. Additionally, Table 1 lists the negotiated text from SDG 14.2 (sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience and acting for their restoration to achieve healthy and productive oceans) concerning coral reefs across overall oceans and seas policy goals and island governments tasks under the SAMOA Pathway, as illustrated in Figure 3 [25].

At the global level, in order to finance the implementation of SDG 14, including coral reef rebuilding, the Prince Albert II of Monaco Foundation and the Paul G. Allen Family Foundation, in collaboration with the UN, have developed the Global Fund for Coral Reefs (GFCR) [46], a multi-partner trust fund [46,71]. The trust fund was launched in 2020 and aims to raise US\$625 million in capital by 2030 [46]. This study places these efforts within the SDG 17, which is to strengthen the means of implementation and revitalize the global partnership for sustainable development, with target 17.3, calling for mobilizing additional financial resources for developing countries from multiple sources.) [72]. It is, therefore, particularly important for island policymakers to align the climate and ocean targets of the SAMOA Pathway in parallel with SDG 17.3 and 13.2 to integrate climate change measures into national policies, strategies and planning through ODA and climate finance, as these

are the most influential targets [73]. Via these SDG interlinkages, island governments can lead the SPI processes for rebuilding coral reefs geared towards the needs of developing nations distinct from developed countries, who also need to fulfil their agreements to decouple economic growth from environmental degradation, as outlined in SDG target 8.4: Improve, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead; sources. <https://unstats.un.org/sdgs/metadata/?Text=&Goal=17&Target=> accessed on 10 May 2021) [74]. Additionally, SDG 8.4 needs to address the relevant industries underpinning the SDG 14 targets [67]. While the SPI, *Rebuilding Coral Reefs: A Decadal Grand Challenge*, recognises SDG 8.4 [35], it also needs to outline which strategic industries developed nations (the global north) will address the decoupling of to avoid further damage to coral reefs. While decoupling is not specifically discussed by industrialised nations [75], island nations continue to suffer a continued labour burden (SDG 8) for most of the coral reef rebuilding efforts; see commentary from islands [10]. It has been argued that the destruction of coral reefs through transnational trade, coastal development agreements, and uncontrolled marine pollution requires innovative climate funding models for collaboration with blue economy sectors and industries [22,76,77]. The finance model for rebuilding coral reefs, explored in Figure 2, has yet to engage industry stakeholders from the outset of the SPI governing process at the UN.

Distinctively, the SAMOA Pathway (Figure 3) has endorsed sustainable, inclusive, and equitable economic growth with decent work for all living in island nations as their first policy priority action [78,79]. This aligns to the SDG 8 targets of the International Labour Organization and is a means of implementation for the entire 2030 Agenda [78,79]. SDG implementers at all levels (Figure 3) have the task of recognising that the ICRS SPI, *Rebuilding Coral Reefs: A Decadal Grand Challenge* [35], and global ocean financing models need the integration of ILO decent work and healthy job creation as per the SDG 8 targets [25,30,63,80]. For SIDS to support reskilling and upskilling, their blue workforce urgently requires innovation in SPI at the UN that is inclusive of the islands' marine scientific community, industry, and private sector actors [47,81,82]. The science-to-policy process mapping the coral reef economy driven from the diving industry has frequently been referenced by grantmakers in the global coral reef funding prospectus [46]. However, such finance models need to incorporate interlinked synergies and trade-offs from across the political, economic, environmental, social, technological, and infrastructure fields to guide actions of operating coral reef economic market segments [25,30,63]. The design of the SDG 14.7 target creates this scope for island policymakers, as it is the only target in SDG 14 that integrates the three pillars of sustainability—economic, social, and environment [41]. This study provides an interpretation of SDG 14.7 in the context of Figure 3 for SIDS under the Global Fund for Coral Reefs, here in relation to the 2022 ICRS SPI, *Rebuilding Coral Reefs: A Decadal Grand Challenge* [35], policy guiding document.

- (a) SDG 14.7 is a politically agreed target that positions and provides clear boundaries between industrialised and non-industrialised nations at the UN and the role of policy evidence to serve the island member states.
- (b) SDG 14.7—also provides direct links to SDG 8 targets pertaining to the International Labor Organisation for fisheries and tourism sectors to reskill and modernise [25,41]. The synergetic nature of SDG 14.7 also links to the ODA partnerships (SDG 17.3), collaboration, and interaction between strategic stakeholders, industry, educational institutions, and government agencies [41].
- (c) SDG 14.7—is time-bounded and must be achieved by 2030 hence requires policy mechanisms for building a competent islands' blue workforce. The target sets the boundaries and differential needs of island nations under climate change and ocean goals.

3.2. Demands to Integrate Blue Skills within Island Coral Reef Economic Sectors and Industry Careers

Given that coral reefs are under national authority, the island governments must take actions via SDG 14.7 to improve the effectiveness of policy delivery at the national level to prevent the unsustainable use of their coral reef resources [6]. SIDS—in particular, Fiji, Grenada, Palau, and Seychelles—are signatories to the 2017 Coral Reef Life Declaration, whereby these states reaffirm commitment to an integrated approach to the economic, social, ecological, and cultural market segments of coral reef services in waters within their national authority [44]. As of 2019, marine tourism sectors and industries represented the most significant economic sector in the Cook Islands, Fiji, the Maldives, Palau, and Vanuatu [1]. Representing the largest and most formal sector for SIDS, the tourism sector demands the integration of marine and climate science with coral reef economic sectors to pool resources for technology, innovation, and infrastructure (SDG 9) for SDG 14 implementation. Hence, questions arise regarding which strategic industries of the tourism industry should be represented as part of the decision-making processes within the SPI in the GCRF finance models. The SPI has recognised the role of the few large transnational corporations involved in coral reef-linked products and the supply chain while neglecting other sectors. In developing the SPI for coral reef rebuilding, several references were made to the economic gains associated with diving in the tourism and fisheries sectors [83,84]. For example, coral reef tourism-generated economic value has been estimated to be \$36 billion annually in coral reef countries [83]. Of this, \$19 billion is generated by dive tourism, involving snorkelling, glass-bottom boats, and services related to the reefs, as well as the associated wildlife observations related to the diving industry [83]. The other \$16 billion is for ‘reef-linked tourism’, which includes beaches, local seafood, and paddleboarding [83]. However, it is well established that most tourism businesses are not inclusive of national-level blue career development, leading to social and ecological disparities in SIDS [78,79,85]. The few companies that dominate the tourism sector industries producing the economic value used in the Rebuilding Coral Reefs: A Decadal Grand Challenge [35] also control the entire supply chain and have a disproportionate influence on decision making [86]. SDG 14.7 encompass not only the linkage of environmental development assistance but also social and economic development. Tourism and fisheries policies must “promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”, as stated in SDG 8 and adopted as the first policy priority by the SAMOA Pathway. Additionally, as adopted in SDG 10, reduce inequality within and among nations, target 10.5, improving regulation of global financial markets and institutions, target 10.9 encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, hereby least developed countries, African countries, Small Island Developing States, and landlocked developing countries, in accordance with their national plans and programmes. Donor countries need to show total resource flows for development to the recipient countries and type of flow (e.g., official development assistance, foreign direct investment, and other flows, as per indicator 10.b. Therefore, there is an urgent need for a SIDS-specific, science-industry policy dialogue [25,41] to review the coral reef rebuilding SPI steering funding model in the case of islands.

3.3. Closing the Gap between the Diving Industry and Island Governments in Their Blue Economy Workforce Preparation

The coral reef declaration, which occurred before the worldwide COVID-19 epidemic, framed that coral reef-related tourism is estimated to generate annual revenues of US 36 billion globally [83]. Before COVID-19, marine tourism and the related industries generated between 20 and 50% of the GDP and over 30% of employment in island nations such as Fiji, the Maldives, and Grenada [87]. However, scuba diving, snorkelling, and seascapes are among the predominant market segments of marine tourism sector jobs in the tropical countries that were negatively impacted by COVID-19. Questions remains about

whether job creation (SDG 8) will recover after COVID-19, raising doubts about the metrics that some of the finance models in Figure 2 are based on. The Global Coral Reef Fund (GCRF) has highlighted SDG 8.9, whereby states should develop policies that promote sustainable tourism that creates jobs and promotes local cultures and products. Island coral reefs remain on the market as top high-end dive sites and tourist destinations [88]; however, the chronic tensions and conflicts over the lack of inclusive policies supporting higher levels of marine education, dive skills, safety at sea needs, and job security cloud the assumptions regarding sustained economic performance, sustainable tourism, and job creation [89–91]. Today, the state of many marine biology and conservation jobs is still not recognised within the formal occupational criteria, and many jobs continue to breach labour laws and the principles of decent work, and it is time that such harmful practices are abolished [33]. The recognition of scientific diving within the legal framework required for meeting the labour and occupation standards under SDG 14 needs to be clarified [41] to those seeking jobs in the public sector, marine park operations, or within marine science in developing states [92]. The SPI at the UN steering funding allocations [9] in projects such as the GEF Ridge-to-Reef for MPAs, coral restoration, and invasive species removal projects have primarily relied on the work of environmental divers, dive instructors, and artisanal divers [41]. While these UN projects have used the diving labour force, they have ignored investments for reskilling, upskilling, and in aligning policies for decent work creation as guided under the mandate of the International Labor Organization (SDG 8). The SPI barriers and the paucity of adequate evidence for policy decisions at the UN level has also violated many safety standards for divers at work and in marine operations involving MPAs and coral restoration efforts [25,41].

Since 2014, SIDS have been calling for genuine partnerships for their development [26] and in addressing the ocean development challenges that have emerged over the last decade and a half [23,24]. Under the SAMOA Pathway, the policy brief “Operationalising the Blue Economy in Small States” framed the need for a wider scope of science-to-policy interfaces for island governments that support policies and strategies that enable new skills, education and training programs, and the reduction of informal employment categories [53]. From the results of this study, it is apparent that such change has not yet materialised within UN development systems. Under the UN-restricted SPI policy-making process, island leaders have struggled to institutionalise and formalise the work of coral reef researchers, marine sectors, and scuba dive labour forces, highlighted as the targeted stakeholders of this study in Figure 2 [41]. Diving careers in academia, marine science, coral restoration, and coral reef resilience building projects, such as “50 Reefs” under “UNEP Coral Bleaching Futures” jobs continue to lack the necessary macro-level policy developmental support [93] required to equip the workforce with the skills needed for current and future jobs. At the same time, these positions require a prolonged period of full-time commitment from marine and diving authorities and training institutions to build capacity and provide safe working conditions [33]. Bridging the gap between the diving industry and its role in transnational marine education and scientific training that meets the needs of island governments requires mechanisms that go beyond the current UN coral reef science-policy interfaces [40].

4. Discussion: The Role of Island Policymakers

Using the accelerator and bottleneck assessment incorporating the categories in Figure 2, this study has identified major gaps in the SPI governing structure, where the scientific advice has failed to shift towards science-industry-government collaborations [47] or partnership-building methodologies with strategic industries [41]. In particular, the diving industry and island diving stakeholders desperately need to be involved in strategic decision making. Funding models still lack opportunities to collaborate and partner with the industry to support technology and infrastructure upgrades for SDG 14 implementation. Furthermore, the social capital of the islands, i.e., diving workforce development, is not adequately considered within the narrow SPI or is ignored altogether. Prior studies have raised

similar concerns regarding the SPI at the UN with top-down approaches [37,93] that face bottlenecks for business and industry actors' participation at policy design levels [2,94,95]. Island governments need to understand the implications of such bottlenecks and prioritise fostering synergies between academia, industry, and government to meet the demand for sustainability science to deliver SDGs as interlinked systems [96]. Several challenges have made it difficult for island negotiators and decision-makers to achieve cooperation between academia, industry, and government—one of which involves who gets to choose the experts selected to guide this process [41]. As a solution to the bottlenecks, in collaboration with the UN Industrial Development Organization (UNIDO), the SIDS grouping has gained agreements for islands' industrial policy development under Agenda 2030 via a Technical Assistance Strategy for the period of 2019–2025 [97]. As a specialised agency, UNIDO has a comparative advantage within the UN system in addressing the industry-related vulnerabilities of SIDS [97] in the wake of the fourth industrial revolution and in helping island governments get out of science-policy governance traps [15,29]. This newly adopted agreement outlines strategies to strengthen interventions to accelerate inclusive and sustainable industrial development (ISID) in SIDS [97]. It provides policy positions and frameworks for the SIDS grouping, represented here in Figure 3, to overcome the SPI pitfalls within current UN development systems. It is the role of island governments, their academic and training institutions, and the diving industry to build synergies and bring about structural and institutional changes in their coral reef policy landscape in order to create public policies that promote and facilitate the relationships between them [25,41]. The interaction between blue workforce knowledge institutions, the diving industry, and government institutions and sectors under SDG 14.7 offers a solution for island governments to create synergistic relationships between the three institutional realms. Marine and scuba science and education encompasses science, technology, engineering, and calls for ports and marina infrastructure for their marine operations, together with expertise and infrastructure for hyperbaric medicine and marine and marine communications [98]. These multidisciplinary development requirements for the implementation of SDG 14 require a macro-level policy framework, and Figure 3 provides a simple visual representation for island governments to review the UN financial models as per their development needs. Additionally, the macro policy landscape (Figure 3) also helps SIDS to position themselves as a particular case with industry, such as the Professional Association of Diving Instructors (PADI), which represents the world's largest scuba diver education organisation [99] and is the central institution that operates in SIDS. The USA, Australia, Canada, Europe, Japan, and New Zealand national education councils recognise PADI SCUBA courses for university credit, professional certification, and education funding [50,99,100]. However, currently, this is rarely the case for SIDS. Shared linkages and collaboration with these institutions under the SPI are restricted at the macro level; hence the SIDS Technical Assistance Strategy for 2019–2025 should be further explored in the case of the diving industry.

5. Conclusions

This study aims to raise awareness among policymakers in SIDS to modernise policies that support coral reef resilience in the context of the 2030 Agenda and other parallel UN processes. In this case, it is crucial to align the UN systems with the SIDS Accelerated Modalities of Action (SAMOA Pathway) [26,66], which outlines the intergovernmental agreements that set forth the institutional rules and processes between SIDS and developed countries. Figure 3 provides a simple visual representation and ways in which SIDS policymakers can understand the parallel processes between the SAMOA Pathway and the SDGs. Most importantly, Figure 3 also helps align the positioning of SIDS' highest policy priorities: sustainable, inclusive, and equitable economic growth with decent work for all [26]. The SAMOA Pathway and Agenda 2030, when assessed in parallel, highlight how SDG 14.7 encompass not only the linkage of environmental development assistance but also social and economic development, as outlined in Table 1.

In the era of SDGs, the inclusion of marine science and blue skills in policy making faces equity, social and cultural differences, and barriers between developing and developed countries [13,15,93]. Using the UNDP SDG Accelerator and Bottleneck Assessment Tool [65] (Figure 2), this study identifies governance bottlenecks by paying particular attention to the synergistic nature of SDG 14.7 with economy and trade, illustrated here by linkages with the dive industry actors, science and academic institutions, and government. This article highlights concerns regarding the ICRS SPI Rebuilding Coral Reefs: A Decadal Grand Challenge, guiding [35] the UN ODA, and hence, calls on island policymakers to pursue greater awareness of their macro policy frameworks, as highlighted in Figure 3 [12]. Island technical and policy advisors and negotiators need to pay additional attention to the kind of evidence presented in SPI [56] at the UN, where ODA and funding decisions for the oceans and climate are being made in the context of implementing the SDGs. The analysis highlights that the nature of policy guidance for mobilising climate finance and official development assistance (ODA) needs to consider the highly synergistic nature of SDG 14.7, which is linked to science, technology, and infrastructure, as well as the industry in the context of trade and business and offers more scope for integrated financing. Otherwise, islands' macro- and micro-level policy design problems are constrained by misdiagnoses of the problems, leading to misrepresentations and miscalculations of financial needs, as highlighted in similar studies [11,63]. This study identifies ways in which policymakers in SIDS can focus on creating important synergies and trade-offs between the SDGs and the climate goals of the Paris Agreement at the global level. In doing so, the most influential goals, such as 17.3 and 13.2 on climate finance and ODA [43] with SIDS oceans and seas goals to build coral reef resilience initiatives, need to be further explored in the rebuilding coral reef financing models. Through the SAMOA Pathway, this article also draws attention to the newly negotiated and member state-approved SIDS Technical Assistance Strategy (2019–2025) for the industrial policy. In particular, SDG 14.7, which is designed to provide the most synergies, needs to be further explored as it provides an opportunity for island policymakers to link the SDGs for coral reef-dependent marine industries and adequately prepare their blue workforce.

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