



Issues of context, capacity and scale: Essential conditions and missing links for a sustainable blue economy

Holly J. Niner^{a,*},¹, Noel C. Barut^b, Tom Baum^{c,d}, Daniela Diz^e, Daniela Laínez del Pozo^f, Stuart Laing^g, Alana Malinde S.N. Lancaster^h, Kirsty A. McQuaid^{a,o}, Tania Mendoⁱ, Elisa Morgera^j, Payal N. Maharaj^k, Ifesinachi Okafor-Yarwood^{l,p}, Kelly Ortega-Cisneros^m, Tapiwa V. Warikandwaⁿ, Sian Rees^a

^a School of Biological and Marine Sciences, University of Plymouth, UK

^b National Fisheries Research and Development Institute, Mother Ignacia Avenue, South Triangle, Quezon City, Philippines

^c Strathclyde Business School, University of Strathclyde, UK

^d School of Tourism and Hospitality, University of Johannesburg, South Africa

^e Institute for Life and Earth Sciences, School of Energy, Geoscience, Infrastructure and Society, Heriot Watt University, UK

^f Departments of Geography and Anthropology, University College London, UK

^g James Michel Blue Economy Research Institute & Department of Environmental Science, University of Seychelles, Seychelles

^h Faculty of Law, The University of the West Indies, Barbados

ⁱ Scottish Oceans Institute, University of St Andrews, UK

^j Strathclyde Centre for Environmental Law and Governance, University of Strathclyde, UK

^k The University of the South Pacific, Suva, Fiji

^l School of Geography and Sustainable Development, University of St Andrews, UK

^m Department of Biological Sciences, University of Cape Town, South Africa

ⁿ Faculty of Law, University of Namibia, Namibia

^o Marine Programme, South African National Biodiversity Institute, South Africa

^p National Defence College, Abuja, Nigeria

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ABSTRACT

The blue economy has roots in the international arena of sustainable development and sets out to unlock opportunities for economy and society whilst protecting and enhancing marine environments. To date there has been no analysis of how this overarching intention for sustainability has influenced the rapid development of blue economy policies at national and regional scales. In this article, we analyse the synergies and conflicts between blue economy policies from a diversity of national and regional policies and the UN Sustainable Development Goals. We show that to maintain critical alignment with targets for sustainability, place-based contextual development of blue economies that meet the needs of all actors is necessary. These needs relate to ensuring resilience against future environmental and political shocks, the maintenance of the ecological basis for thriving blue economies, and capacity development at all levels to support effective and equitable governance. Results indicate that co-production will be important to achieve sustainable blue economies.

1. Introduction

The blue economy concept arose from demands to address the failures of the green economy (Brundtland, 1987) to capture the importance of marine and ocean environments to their nations and economies (Gruby et al., 2016; Maclellan, 2015; Pauli, 2010; Silver et al., 2015;

Whisnant and Reyes, 2015). Both concepts are founded on acknowledgement that the traditional economic models of human production and consumption have not adequately incorporated the full range of resources and values that contribute to a thriving economy that supports societal wellbeing (Brundtland, 1987).

Traction of the blue economy is growing, as evidenced through

* Corresponding author.

E-mail address: holly.niner@plymouth.ac.uk (H.J. Niner).

¹ Lead author contact details: Holly J. Niner, Marine Building, School of Biological and Marine Sciences, Drake Circus, Plymouth, PL4 8AA, UK

institutional uptake by the World Bank, the Organisation for Economic Cooperation and Development (OECD) and the United Nations (UN), among others (Voyer et al., 2018). Yet conceptually, its definition remains loose (Eikeset et al., 2018) with working definitions following the needs and wants of the user (Carver, 2020; Cisneros-Montemayor et al., 2021; Silver et al., 2015). Similar to the fate of the Green Economy and its founding principle of sustainable development (Bina, 2013), the concept has been critiqued as prioritising economics and growth over the ecological, social and political dimensions of sustainability (Wanner, 2015). Critical analysis has shown that whilst the blue economy has been cast as a route to sustainable development, for many regions and sectors it is seeking this through growth driven exploitation of the natural resource base (Andriamahefazafy et al., 2020), and there is limited evidence to date that the progress is following a sustainable interpretation.

The paradox of meeting sustainable development through intensive exploitation strategies driven by aims of economic growth has the potential to favour powerful actors that are often removed from the activity. An example of this is the technological innovation in tuna fisheries, where advancements in fleet efficiency and harvesting techniques have accrued primarily to those historically invested in the fishery, such as distant water fishing nations and industrial actors, to the detriment of the sustainability of the natural resource and small-scale local fisheries (Andriamahefazafy et al., 2020). Similar examples whereby economic gains have been pursued through development projects that have negative consequences for natural resources and those directly dependent on them can be found throughout literature (e.g. Okafor-Yarwood et al., 2020).

Sustainability itself is complex and progress towards its achievement has been difficult to capture. In response to this complexity, the UN Sustainable Development Goals (SDGs) (United Nations, 2015a) were unanimously adopted by the UN General Assembly and recognise that systemic societal issues, such as poverty, gender inequality, and poor societal wellbeing, are intertwined with the conditions of the natural world and human relationships to it. Accordingly, the SDGs present a suite of targets, many of which are indivisible or have strong connections linking complex social-ecological relationships necessary for just sustainability (Nilsson et al., 2016; Singh et al., 2018). This interdependency is also reflected in the connections that the SDGs have to other areas of international law, for example human rights law (Morgera, 2020) and biological diversity (CBD, 1992).

Meeting SDG 14 (life below water) is often cited as critical for the blue economy, but cannot be considered in isolation from the full suite of interconnected goals (Lee et al., 2020; Singh et al., 2018). In particular, SDG 14 has been criticised for having too restricted a focus on ecological condition and for insufficiently capturing the social-ecological context within which many of the drivers of marine biodiversity decline are occurring (Ntona and Morgera, 2018). Furthermore, despite the importance of the natural environment and specifically the ocean to global society (and its economies) for ecosystem services such as food and climate control (Costanza, 1999; Laffoley et al., 2020; Mace et al., 2018; Dasgupta, 2021), among others, SDG 14 has had low prioritisation (Custer et al., 2018) and only 2% of countries are on track to meet the goal by 2030 (Nash et al., 2020). One reason for this is suggested to lie in the restricted framing of SDG 14 and its measures of success which can obscure the complex interrelationships of different aspects of sustainability and therefore the maintenance of ‘life below water’ (Nash et al., 2020; Singh et al., 2018).

To realise sustainable visions of blue economies, interpretation needs to reflect the location and community within which they are being enacted. This is necessary to match the resource base (Singh et al., 2018) and cultural context so that sustainability can meet the needs of those involved in, or affected by a blue economy (Cisneros-Montemayor et al., 2021). Co-development of blue economies is one way to achieve this and if undertaken comprehensively would involve all actors from government, to corporate business down to small-scale fishers and those that

depend on marine natural resources for income, food and cultural purposes (Okafor-Yarwood et al., 2020). In line with targets set out under SDGs 10 (Reduce inequality within and among countries) and 16 (Peace, justice and strong institutions), capacity development will be essential to support robust and fair co-development practice to ensure effective and meaningful strategies that ‘empower’ rather than solely ‘reach’ historically marginalised groups (Mangubhai and Lawless, 2021). Given that the ‘checks and balances’ on how blue economies should be enacted to meet holistic definitions of sustainability remain outstanding, it is currently unknown how co-development is reflected or supported in existing policy aims.

There have been calls to ensure that the progression of the blue economy is aligned with other sustainability policies in place, such as the internationally mandated SDGs, to ensure that it supports the conditions necessary for the sustainable use of natural resources (Sarker et al., 2018). With many blue economies at a nascent stage, there is a policy window for natural and social sciences, to assist in its definition to fit aims of sustainability and resist misuse or misinterpretation (Bednarek et al., 2018; Eikeset et al., 2018; Rose et al., 2020). To support governments and decision-makers in progressing a sustainable blue economy, this research takes a two-stage approach: 1) a global review of blue economy policies, 2) a series of multi-stakeholder workshops to classify the interactions between blue economy policies and the SDGs. This appraisal forms an important initial step in developing the checks and balances for the governance of blue economies globally. It serves as a guide for those involved in its operationalisation, including policy-makers and the private sector.

2. Methods

2.1. Creating a typology

A typology of blue economy aims was distilled from a global thematic analysis of blue economy policies. Blue economy policies were identified through an online systematic review to obtain a snapshot of current (February 2021) regional or national ‘blue economy’ policy. For the purposes of this review, where we are considering blue economy aspirations, we defined relevant policies as those that related to high level policy aims across marine sectors for the use of marine resources and space. This criterion identified 37 national and regional policies that framed blue economy aspirations (Appendix 1, Table A2). Using these policies, a typology was generated through examination of policy aims and the inductive generation of a thematic framework. For a detailed account of the methods followed and the data gathered, see Appendix 1. The typology created and applied in the subsequent analysis of synergies with the SDGs included 16 types (Table 1); these types did not apply uniformly across all policies. For more detail on their prevalence within global blue economy policy see Appendix 1, Table A2.

2.2. The synergies approach

2.2.1. Evaluating interactions

This analysis follows the SDG synergies approach developed and refined by Weitz et al., (2019, 2018) to systematically appraise the interactions between the targets of the SDGs. Adapting this to focus on a typology of blue economy policy aims shows how variation in the policy mix interacts with sustainability as defined by the SDGs. We firstly identified the SDG targets to be taken forward to assessment using the following criteria:

- i. Special emphasis on goals/targets relevant to the blue economy and/or marine sustainability.
- ii. Representation across all SDG goals to understand how and where the blue economy exerts influence on the sustainability agenda.
- iii. No more than 40 to facilitate evaluation (see Weitz et al., 2018).

Table 1
Typology of blue economy aims, for further detail refer to Tables A1 and A3.

Type	Characterisation
Economic growth	To harness ocean wealth.
Competitive edge	To obtain international influence and exert leadership.
International cooperation	To maintain or improve international relations.
Extending reach	To access international markets.
Diversification	To develop new emerging sectors.
Technological innovation	To support innovation to increase capacity, 'clean' industry, and for new applications.
National security	To control and ensure security of ocean wealth.
Operational safety	To ensure safety at sea for people.
Attract investment	To incentivise and attract investment.
Governance	To develop operational, efficient and representative governance systems that support the blue economy.
Livelihoods	To protect and enhance jobs, food, wellbeing, and heritage.
Capacity and skills	To develop education, skills, research, expertise and knowledge for a blue economy.
Science	To build knowledge of marine natural systems.
Environmental protection	To conserve marine resources and ecosystem services.
Marine literacy	To promote visibility, awareness, understanding, connection with marine environments.
Climate change	To increase resilience and reduce adverse impacts of climate change.

- iv. Selected targets should reflect the core identity of the SDG to which they belong.
- v. Selected targets should span rather than focus the issues.

The SDGs and their corresponding targets were broadly assessed against the typology of blue economy aims (Table 1) to gauge the relevance of the SDG targets in addition to these criteria. This initial assessment was undertaken by the lead author and was applied to SDG outcome targets (numerical) and excluded the means of implementation (MOI) targets (alphabetical). MOI targets are criticised for poor, inconsistent conceptualisation (Bartram et al., 2018), and aim to create an enabling environment for sustainable development. By nature, they are cross-cutting across other goals and also overlap with Goal 17, which focusses entirely on the means of implementation and achieving the SDGs (Bartram et al., 2018). It was concluded that limiting this assessment to outcome-based targets would produce a clearer presentation of the relationships between blue economy aims and the SDGs. The final selection is based on those targets which scored most highly against the criteria outlined above. Where there was little distinction between target scores or a uniformly low score, it was decided to take forward the goal for assessment, rather than select targets. The selection was subsequently reviewed by the authorship to ensure agreement and refinement based on individual experiences and areas of expertise within the field of marine governance.

The final selection comprised 32 goals and targets as presented in Table 2, with the full description of each goal or target provided in Appendix 1 (Table A3). It was decided to consider SDGs 1, 2, 3, 5, 6, 7, 13 and 16 at goal level and for each of the remaining SDGs two targets were selected. All the outcome targets for SDG 14 – Life Below Water, the marine focussed SDG, were selected for consideration, to understand how the blue economy relates to the high-level policy framing of marine sustainability. Interactions between blue economy policy aim types (Table 1) and the selected SDG goals and targets (Table 2) were then scored in both directions (e.g., x on y, and y on x) with respect to the guiding question – *if there is progress towards aim/target/goal x, how would aim/target/goal y react?* Scoring was undertaken using the seven-point scale detailed in Table 3, adapted from (Nilsson et al., 2016; Weitz et al., 2019). This scale was adapted iteratively to include an “ambiguous” (± 1) option where it was felt that without specific contextual information interactions could easily be positive or negative (see Section 3.1. for more detail). A further ambiguous classification was also applied for those interactions where it was felt that with different contexts

Table 2
SDGs and targets selected for synergies assessment.

Goal #	Target #.	Short description
1		No poverty.
2	2.1	No hunger and access to nutritious food.
	2.3	Equitably increase productivity and incomes.
3		Good health and wellbeing.
4	4.4	Technical/vocational skills.
	4.7	Knowledge and skills for sustainable development and lifestyles.
5		Gender equality.
6		Clean water and sanitation.
7		Affordable and clean energy.
8	8.3	Policy support for economic activity across society.
	8.4	Decouple economic growth from environmental degradation.
9	9.1	Sustainable, resilient and fair infrastructure development.
	9.5	Technological capabilities for innovation.
10	10.1	Increase the lowest incomes.
	10.6	Representative governance.
11	11.4	Protect cultural and natural heritage.
	11.5	Increase resilience to disaster.
12	12.2	Sustainable use of natural resources.
	12.8	Societal awareness of sustainability.
13		Climate action.
14	14.1	Reduce pollution.
	14.2	Conservation of marine and coastal ecosystems.
	14.3	Address ocean acidification.
	14.4	Sustainable fishing.
	14.5	Conserve at least 10% of marine areas.
	14.6	Halt inefficient and unfair fisheries subsidies.
	14.7	Enhance economic benefits of marine origin for SIDS.
15	15.5	Prevent loss of biodiversity.
	15.6	Equitable and just use of genetic resources.
16		Peace, justice and strong institutions.
17	17.9	Capacity development.
	17.16	Systemic issues: multi-stakeholder partnerships.

interactions could be either reinforcing or counteracting (± 2).

Analysis was undertaken through a series ($n = 20$) of online focus groups (average number of participants = 4 including the lead author) with the authorship team, who are predominantly based in academic roles and involved in the development, implementation and analysis of marine governance and sustainability in a range of global, sectoral, and disciplinary contexts. Participants were identified using a snowballing technique leveraging the international network of the One Ocean Hub (One Ocean Hub, 2020). Nilsson et al. (2016) and Weitz et al., (2019, 2018) indicated a weakness in the method where high-level analysis of policy is challenged by a lack of local or national contextualisation. To address this issue participants were recruited across a diverse field of location, expertise, and experiences. The range of participants enabled broad discussion of scenarios and experiences to theoretically contextualise interactions between blue economies and SDGs. Workshops were facilitated by the lead author and detailed notes were made to inform discussion over areas of contention and to supplement quantitative results with an element of qualitative analysis to explore the perspectives of participants and the context within which interactions were defined. Any disagreement between scores were cross-checked with explanatory notes in ‘mop up’ workshops to revisit the interactions in questions.

3. Results

3.1. General trends

When considering interactions as driven by progress towards the SDGs, relationships were more positive than when considered as being driven by blue economy aims. This can be observed in comparing Fig. 1a against 1b. In the direction driven by progress towards the SDGs (Fig. 1b), 83% of interactions were considered positive, 3% were considered negative, 11% were considered neutral and 3% were

Table 3
Classification of interaction between blue economy policy aim type and SDG or associated target.

Score	Interaction type	Explanation	Example
+ 3	Indivisible	Aim inextricably linked to the achievement of SDG.	Ensuring that all learners acquire the knowledge and skills needed to promote sustainable development is indivisible from blue economy policy aims of improving marine literacy.
+ 2	Reinforcing	Aim aids the achievement of an SDG.	Technological innovation through altered ways of working, e.g., through digitalisation, may support for home-based or more flexible forms of work that can support gender equality.
+ 1	Enabling	Aim creates conditions that further progress towards an SDG.	Reduction in mortality at sea may enable education by securing household income and reducing drivers for dropping out.
0	Neutral	No significant positive or negative interactions.	Ensuring access to water and sanitation does not interact with safety at sea.
± 1	Ambiguous constraining	Interactions were considered to be enabling (+1) or constraining (−1), depending on context.	A focus on protecting the poor and vulnerable may be achieved through long term visions to enable societal marine literacy and connection with the ocean. However, a focus on disaster response could constrain available funding and efforts for marine literacy.
± 2	Ambiguous counteracting	Interactions were considered to be reinforcing (+2) or counteracting (−2), depending on context.	If security is interpreted as securing national resource this may counteract the sustainable management and efficient use of natural resources which ecologically might require cross-boundary management. However, security could also reinforce management by protecting from unregulated extraction.
-1	Constraining	Aim limits options on an SDG.	Pursuing a climate resilient mode of development can constrain options for energy access.
-2	Counteracting	Aim clashes with an SDG.	A strong stance on national security and sovereignty may challenge the reduction of inequality within and among countries by reducing options for participation and partnership.
-3	Cancelling	Aim makes it impossible to reach an SDG.	Aggressively harnessing ocean wealth as a primary target could lead to marine and coastal environmental degradation.

Adapted from Nilsson et al. (2016)

considered ambiguous. In the opposite direction, driven by progress towards blue economy aims (Fig. 1a), 65% of interactions were considered positive, 3% negative, 26% neutral, and 6% ambiguous. Interactions considered to be indivisible were higher when considered to be driven by progress towards the SDGs (n = 96) as compared to when driven by blue economy aim types (n = 57). Similarly, interactions classified as reinforcing were also higher when considered from the direction of SDG progress (n = 154) vs from the direction of progress towards blue economy aims (n = 102). Similar numbers of interactions for both directions were classified as enabling (n = 177, n = 176). Those interactions classified as neutral were much higher when driven by progress towards blue economy aims (n = 135), with only 55 interactions classified as neutral in the opposite direction. Similar numbers of interactions were considered negative, but these interactions vary when considered as being driven by progress towards blue economy aims or the SDGs (Fig. 1).

Contextual information for both aims and SDG targets was a frequently raised issue for workshop participants when appraising interaction classification. This was highlighted where participants felt that in the absence of a clear sense of the framing of a blue economy aim type or SDG, an interaction could equally be enabling (+1) or constraining (−1), or stronger (± 2). These ambiguous interactions necessitated an expansion of the classification matrix (Table 1, Fig. 1), as they were characterised differently from those considered to be neutral, in that it was perceived that there was a material relationship between the items. It was further agreed that these ambiguous aims or interactions would most likely be those that varied depending on the cultural or national context within which they were enacted. For example, if aims of *Economic growth* or *Technological innovation* were pursued with a sustainability ethic, then they would likely have a positive interaction with the SDGs, however this could be negative if they were progressed at any cost, for example through expansion of fossil fuel extraction.

Progress towards the blue economy aims of *Economic growth* and *Technological innovation* were associated with the largest number of ambiguous relationships with the SDGs (see Figs. 1 and 3). The SDGs considered to have the most ambiguous relationship with progress towards blue economy aims were SDG 12.2, 14.7, 15.6 and 16. This uncertainty arose from the national focus of policy aims and ambiguity around the definition of terms such as ‘efficient’, which at different scales could have varying outcomes. Uncertainty of the effectiveness of existing governance to support or undermine the ethics of sustainability or justice also contributed to this position. When considering interactions as being driven by progress towards the SDGs, ambiguity was less prevalent; reflecting on this, participants felt this was because the SDGs allowed for a tighter framing of the blue economy aim types.

3.2. SDG 14 – Life below water

On examining SDG 14 and how its achievement relates to blue economy aims (Fig. 1), the most influential aims were *International cooperation*, *Governance* and *Environmental protection*. There was a high prevalence of neutral relationships in relation to the aim of *Operational safety*. The number of interactions considered to be neutral overall was double when driven by progress towards blue economy aims (23%) as compared to being driven by progress towards the SDGs (9%). The aim of harnessing ocean wealth (*Economic growth*) was considered highly ambiguous, particularly when considered from the direction driven by progress towards blue economy aims. *Extending reach* to access international markets was considered to conflict with several SDG targets, and an aim of *Livelihoods*, to ensure a good quality of life, was considered to counteract with SDG 14.1 and 14.4. SDG 14.6. was overall considered to be the most weakly associated with progress towards blue economy aims.

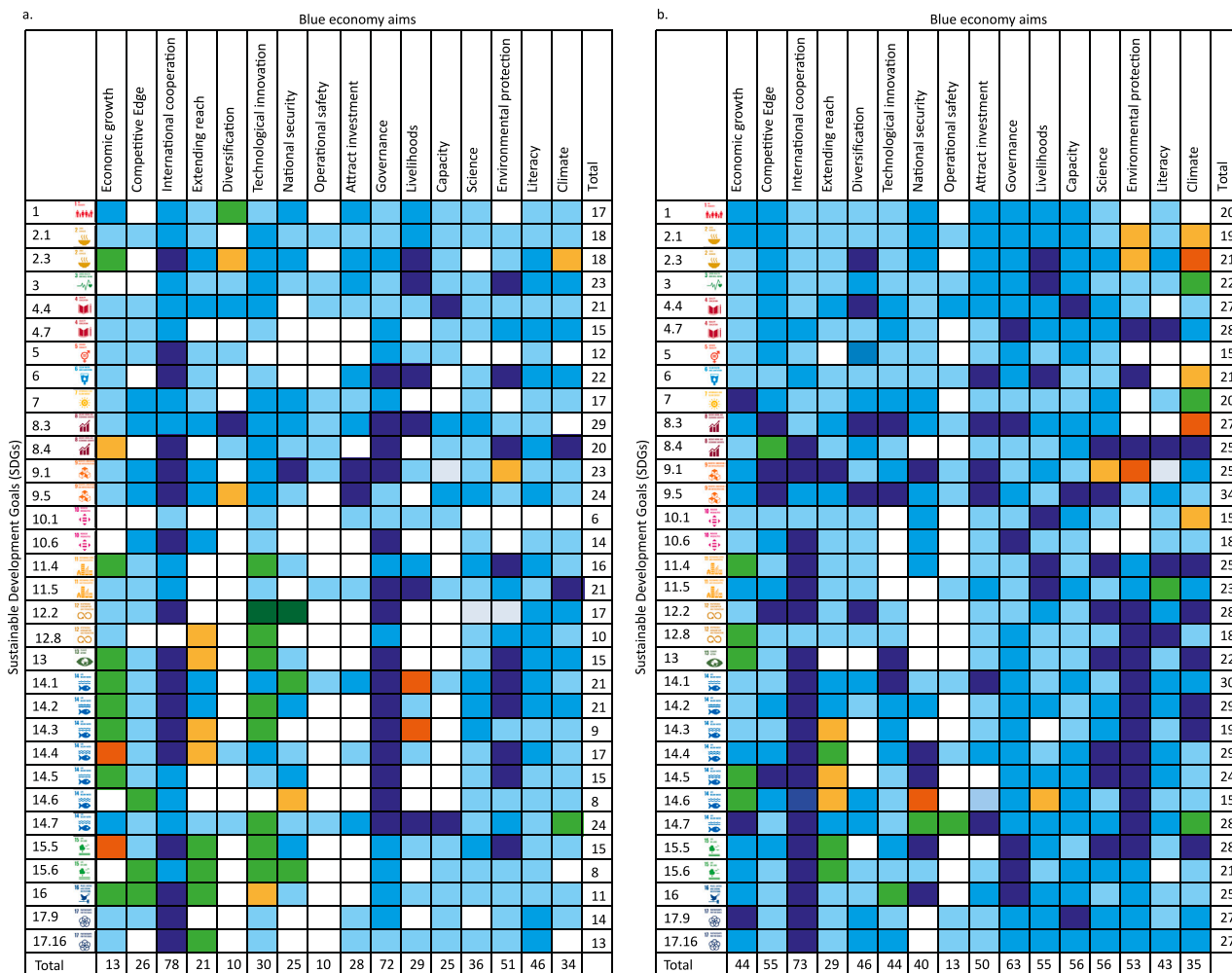


Fig. 1. Matrix of interaction classifications considered as driven by progress towards the (a.) blue economy aims and (b.) the SDGs. Dark blue (indivisible +3), Mid blue (reinforcing +2), Light blue (enabling +1), White (neutral 0), Light green (ambiguous constraining ± 1), Dark green (ambiguous counteracting ± 2), Light orange (constraining -1), Dark orange (counteracting -2). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

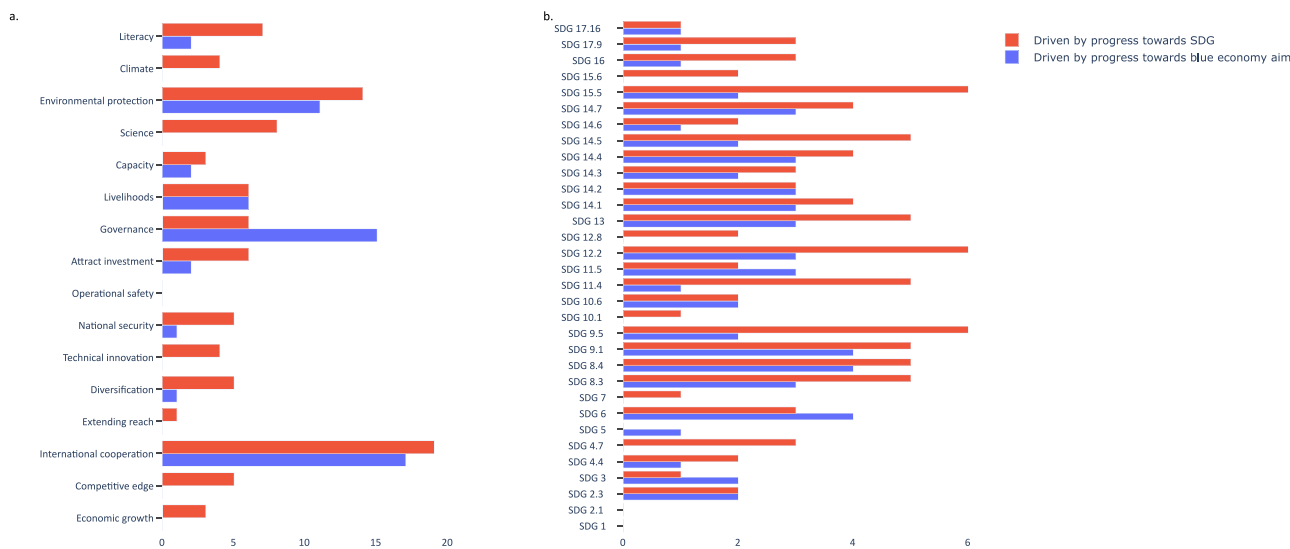


Fig. 2. The frequency of indivisible interactions between blue economy aims and SDG targets. Fig. 2a shows those interactions associated with blue economy aim type, and 2b those associated with the SDGs. Red indicates interactions driven by progress towards SDG targets and blue driven by blue economy aims. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

3.3. Assessing influence

3.3.1. Synergistic relationships

The majority of interactions were considered to be either enabling (+1) or reinforcing (+2), with 61% of interactions considered falling under these categories when driven by progress towards blue economy aims, and 65% when driven by progress towards the SDGs (Fig. 1). Indivisible relationships show those interactions that are inextricably linked, i.e., progress toward a blue economy aim will also result in progress toward an SDG target. Overall, there were more indivisible relationships when considering progress as driven by the SDGs (n = 96) than by that towards blue economy aims (n = 57) (Fig. 1). Among the blue economy aim types, three were clearly dominant with the highest indivisible interactions i.e., *International cooperation*, *Environmental protection* and *Governance* (Fig. 2). *International cooperation* and *Environmental protection* had the highest cumulative total number (i.e., combining outputs for all targets) of indivisible interactions with the SDGs (Fig. 2). The aim of *Governance* was associated with a relatively high number of indivisible interactions (n = 15) when driven by progress towards the blue economy aims with fewer indivisible interactions viewed as being driven by the SDGs (n = 6). *Operational safety* was the only blue economy aim type considered to have no indivisible interactions with the SDGs.

Among the SDG targets, indivisible interactions were spread more evenly than between blue economy aim types (Fig. 2). Those SDGs considered to have the highest cumulative total of indivisible relationships with the blue economy aims were SDGs 8.4, 9.1 and 12.2. Similarly, the SDGs considered most closely linked (as indicated by the number of indivisible links) when driven by progress toward the SDGs included SDG 12.2, but also SDGs 9.5 and 15.5. The targets under SDG 14 had an average cumulative score of six indivisible interactions per target. Progress towards SDG 14.6 was most weakly associated with progress towards the blue economy aims, with a total of three interactions considered to be indivisible. SDGs 5, 7, and 10.1 were only considered to have a single indivisible interaction with blue economy aims, and SDGs 1 and 2.1 were not considered to have any.

3.3.2. Conflicting relationships

Negative interactions are illustrated in Fig. 3. The blue economy aims of increasing resilience to *Climate change* and *Extending reach* to access international markets were considered to have the highest total number of conflicting interactions with the SDGs. Those aims considered to have counteracting (−2) relationships with progress towards the SDGs were *Climate* (n = 2), *Environmental protection* (n = 1), *Livelihoods*

(n = 2) and *National Security* (n = 1) (see Table 1 for descriptions of aims). Six aims were not considered to have any associated conflicting interactions (Fig. 3). The SDGs considered to have the highest total number of conflicting interactions were SDG 14.6. and SDG 2.3 (Figure 4). Counteracting interactions driven by progress towards blue economy aims were related to SDGs 14.1, 14.3, 14.4 and 15.5. Counteracting interactions occurring when considering the relationship as being driven by progress towards the SDGs were thought to relate to SDGs 2.3, 8.3 and 14.6. More than fifty percent of SDG targets analysed were not considered to have any associated conflicting relationships with blue economy aims.

When considering interactions identified by participants as ambiguous, the potential for the blue economy aims to conflict with progress towards the SDGs related strongly to aims of *Technological innovation*, *Economic growth*, *Climate change* and *Extending reach* (Fig. 3). The ambiguity associated with the SDGs displayed in Figure 4 is more strongly driven by progress towards the blue economy aims than the SDGs. The ambiguity here indicates that SDGs 2.3, 14.3, 14.6, 15.6 and 16 have the highest potential to conflict with the blue economy aims. Aims of increased *National security*, *Technological innovation*, and SDGs 2.1, 4.4 and 12.2 were considered to have potentially counteracting interactions if they are not framed in line with the vision for the other aim or target.

3.3.3. Neutral relationships

The blue economy aims that were appraised to have the lowest influence on progress towards the SDGs, as inferred by the highest number of neutral interactions, were *Operational safety* to ensure safety at sea for people (n = 22) and *Diversification* to develop new sectors (n = 22). When interactions were considered as driven by progress towards the SDGs, *Operational safety* was the least likely to be influenced by progress in this direction (n = 19). The SDGs that were considered least likely to interact with the blue economy were 10.1, 10.6, 12.8 and 14.6, when considered from the direction of progress of blue economy aims. In the opposite direction, led by progress towards the SDGs, the number of interactions assessed to be neutral were fewer, and the SDG considered to be the least influential was SDG 5.

4. Discussion

Much of the discourse surrounding the development of blue economies aligns to that of the SDGs, and this is attributed to shared roots in international development (Silver et al., 2015). Accordingly, it is unsurprising that we found the interactions between blue economy policy aims and the SDGs to be broadly complimentary. Despite clear synergy

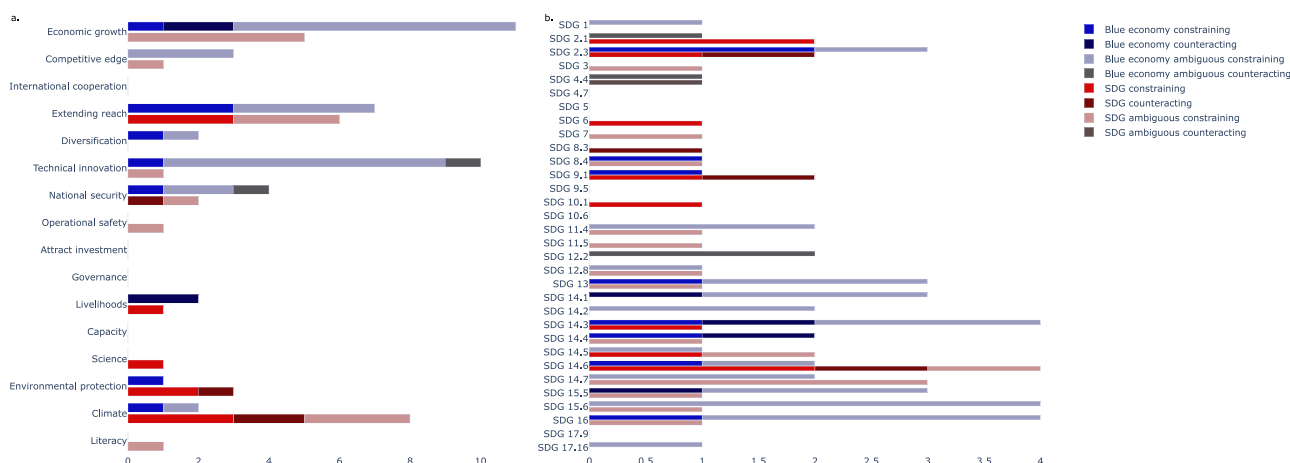


Fig. 3. The frequency of negative (−1 constraining and −2 counteracting) and ambiguous interactions between blue economy aims and SDGs. Fig. 3a shows those interactions associated with blue economy aim type, and 3b those associated with the SDGs. Blue interactions indicate those driven by progress towards blue economy aims, and red interactions those driven by progress towards the SDGs. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

between the concepts, interactions were considered to be more positive (i.e., more indivisible and fewer neutral or ambiguous) when driven by progress towards the SDGs rather than blue economy aim types. This was highlighted through a repeated perception by workshop participants that progress towards the SDGs would not happen without corresponding progress towards many of the blue economy aims. This perception was based on the logic that progress towards the SDGs would strengthen the foundations critical to the enhancement of existing and new activity occurring under the auspices of blue economy strategies. An example would be where progress towards representative governance (SDG 10.6) would support resilience of blue economies through comprehensive inclusion of actors to meet an aim of efficient and representative *Governance*. This result showcased that blue economy policies, as written, are currently capturing many of the key elements needed for ocean sustainability. Our results also support previous analyses that demonstrate how ocean sustainability is intrinsically linked to complex socio-cultural issues as represented by the full spectrum of the SDGs and not limited to SDG 14 (Nash et al., 2020; Ntona and Morgera, 2018; Singh et al., 2018).

4.1. Drivers for sustainability

With a key driver for the progression of sustainable blue economies being the international agenda for economic development, aims of sustainability intersect with wider global commitments to uphold human rights and ensure equitable benefit-sharing from the conservation and sustainable use of natural resources and ecosystems (Morgera, 2018; Wynberg and Hauck, 2014). Participants described how positive interactions between the SDGs and blue economy aims were influenced by the commitment to uphold norms on human rights and benefit-sharing established by the international development agenda. These norms were felt to drive public and private policy towards sustainable practices, while creating disincentives for unsustainable activities (see Antoncic et al., 2020). Adherence to international norms for sustainability can support access to finance (e.g. Equator Principles Association, 2013), global markets such as through eco-certification (Wakamatsu and Wakamatsu, 2017) and also support collaborative management of shared and connected resources through establishing a common aim.

For some interactions, such as those between climate related SDGs (e.g., 13) and blue economy aims seeking economic gain, embedding sustainability within business decisions could present potential risk for actors through constraining activity (e.g., fossil fuel development). These risks could lead to aims of a sustainable blue economy being reduced to rhetoric and for extractive models to dominate. Further indications that international norms for sustainability do not influence all aspects of a blue economy are exemplified by the ongoing multi decadal discussions at the World Trade Organisation (WTO) to reduce harmful fishing subsidies (IISD, 2020). These subsidies drive the depletion of fish stocks through the promotion of high-capacity distant water fishing fleets, and the urgent need for their prohibition is enshrined by SDG 14.6 with a deadline of 2020. Despite the gravity of this issue, particularly for groups dependent on fish protein (Hicks et al., 2019), this deadline has lapsed without progress (IISD, 2020; Parkes, 2021) with the current draft on fisheries subsidies being rescheduled to go before the 12th Ministerial Conference in March 2022. The prohibition of harmful fishing subsidies would likely have further consequences on other aspects of the blue economy such as aims seeking to advance technical and human capacity, livelihoods, and well-being. A reduction in 'perverse subsidies' may open opportunities to redirect public funding to alternative modes of support such as investment in the research and promotion of ecologically sound methods of fishing and aquaculture or the provision of specialised health and education programmes for fishers (Sumaila et al., 2021, 2020). While subsidy removal is thought essential to protect the productivity of global fisheries and therefore the right to food for fish protein dependent communities (Villasante et al., 2022),

adverse consequences are also possible, such as potential (likely temporary) changes in domestic fish supply for these same communities (Harper and Sumaila, 2019). These negative impacts although temporary could cause progress towards both the SDGs and blue economy aims to falter. Programmes for the removal of fishing subsidies should be considered as part of a broader strategy to mitigate against negative consequences for small-scale fishing communities and women that may have been reliant to some degree on subsidised fisheries. Again, such a programme could incorporate activities and capacity enhancement for diversification in addition to education and health programmes that support progress towards the SDGs and a wide range of blue economy aims (Harper and Sumaila, 2019).

Contextualisation of both concepts, the blue economy and sustainability was identified by workshop participants as critical to exploring or understanding interactions and to ensure that sustainability is embedded within developing economies. While the SDGs provide a framework to explore sustainability, they have also been criticised, including by workshop participants, as lacking definition (Nash et al., 2020). The lack of definition is driven by a need for generalisation and simplification to support universal measurement (Nash et al., 2020). However, the need for generalisation challenges the place-based interpretations of sustainability, that build in context specific local and traditional knowledge understood to be necessary to address complex societal issues (Nash et al., 2020; Okafor-Yarwood et al., 2020; Singh et al., 2018). Similarly, interpreting blue economy aims outside of specific national and local contexts was found to be difficult by workshop participants. This experience highlighted the importance of context to consider what a sustainable blue economy might look like; for example, there was common agreement that this would likely be very different between low and high-income countries. Furthermore, cultural specificities relating to gender empowerment (SDG 5) and societal responses to poverty alleviation (SDG 1) were felt to strongly influence how the intersection of blue economies and sustainability were considered. This demonstrates the challenges of how the practical implementation of blue economies at a national or regional level remain accountable to the global commitment to sustainability. With no obvious strategy for monitoring and evaluating blue economy development against the spectrum of SDG targets, there are no checks or balances to determine progress. This presents a vulnerability, an open door, for extractive and potentially unsustainable practices to proliferate.

4.2. Sustainability weak spots

Previous analysis indicates that *Technological innovation* and *Economic growth* are considered central concepts for the realisation of both sustainability and blue economies (Silver et al., 2015; Voyer et al., 2018). The SDGs that relate thematically to these blue economy aims are SDGs 8 (Decent work and economic growth) and 9 (Industry, innovation, and infrastructure). These SDGs were considered as the most influential for progress towards blue economy aims (i.e., had the highest number of indivisible links). However, the corresponding aims of *Technological innovation* and *Economic growth* were also considered to be the most ambiguous. In this sense workshop participants felt that in the absence of a clear contextual framing of the blue economy aim type or SDG target/goal, an interaction could equally be positive or negative. An example discussed was the importance of *Technological innovation* for the cleaner production of energy, food, and resources. Workshop participants reflected on how technological advances, while important for sustainability, could similarly support the intensification and growth of potentially highly damaging extractive industries, such as deep-sea mining (Van Dover et al., 2017).

Only 14% of blue economy policies included an aim to promote control and security of ocean wealth (Tables A2 and A3). Accordingly, our results do not support findings elsewhere in the literature that the securitization of marine resources and space is a common narrative of developing blue economies (Bueger, 2015; Voyer et al., 2018). The blue

economy aim focussing on *National security* varied slightly in intent, ranging from acknowledgement of the essential right of passage for the transit of goods and the prevention of piracy as required under the 1982 UNCLOS, to ownership and control of resources to support a blue economy (for further detail see [Appendix 1, Table A3](#)). When considering *National security* as a way for States to control access to ocean wealth it can be viewed as an enabler of the blue economy ([Cisneros-Montemayor et al., 2021](#); [Okafor-Yarwood, 2020](#); [Voyer et al., 2018](#)), for example, where the military is involved in tackling illegal, unreported and unregulated (IUU) fishing ([Octavian et al., 2020](#)). However, our results suggest that securitisation of national resources/waters does not strongly or uniformly complement aims of sustainability. Not aligning the blue economy aim of *National security* with the aims of the SDGs risks furthering the exclusion of historically marginalised sectors of society (such as those dependent on coastal resources for subsistence) from the benefits of a blue economy (e.g. [Carver, 2019](#)) while seeking to control rights and access to 'ocean wealth'. Many aspects of a blue economy cross jurisdictions (e.g., trade, transboundary fish stocks), therefore moves by individual States towards prioritising *National security* require negotiation, consensus building and (potentially) concession across boundaries, as promoted specifically by SDG 17. These examples underscore how, without a specific framing for blue economy aims, it is possible that blue economies may develop in opposition to, and independently of, the aims of sustainability. This highlights the absence of an operational definition of the blue economy concept at global, regional and national levels, where aims can be interpreted to serve increased extraction ([Eikeset et al., 2018](#); [Voyer et al., 2018](#)).

Similarly, the SDGs also require contextual interpretation for effective operationalisation. The need for this is shown by neutral interactions within our analysis, where workshop participants did not attribute an interaction between a blue economy aim and the SDGs. One such gap relates to the blue economy aim of ensuring safety at sea through processes to improve *Operational safety*. While in our analyses the aim was perceived as weakly interacting with sustainability *Operational safety* is a particularly important concern for developing economies, such as those in Africa and Asia ([Amponsah-Tawiah, 2013](#)) and for the maritime industry ([Wang et al., 2020](#)). Poor occupational health and associated reductions of worker capacity are attributed to economic losses. In Ghana these losses have been documented as approximately seven percent of GDP ([Adei and Kunfaa, 2007](#); [Amponsah-Tawiah, 2013](#)). A correlation between investment in occupational health and safety, environmental sustainability and economic strength is also evident, where those countries and organisations with the lowest investment in these issues have the lowest productivity and weakest economies, and vice versa ([Amponsah-Tawiah, 2013](#); [WHO, 1995](#)). A blue economy aim encompassing the issue was found in 18 (48%) blue economy policies ([Appendix 1, Table A2](#)). Despite the demonstrable links between *Operational safety* and sustainability linked to aspects of human wellbeing, our analysis highlighted a perceived neutrality between the concepts when set against the SDGs, perhaps reflecting the difficulty in assessing this aim at a high level. Without setting *Operational safety* as a target for the SDGs (e.g., number of maritime businesses or the blue economy industrial sectors with internationally recognised standards for operational safety), progress towards multiple goals linked to livelihoods and wellbeing may be challenged. Again, this exemplifies the importance of linking local impacts, which may vary in significance depending on the specific context, to high-level drivers for both the blue economy and sustainability.

Another gap identified was the absence of strong synergies to support the empowerment of people to shape a blue economy. SDGs that support equality, representation (SDG 10.1 and 10.6) and access to information (SDG 12.8) were relatively weakly supported when driven by progress towards a blue economy unbounded by the SDGs. SDG 5 (gender equality) was also considered to have a weak interaction with the blue economy. These SDGs similarly seek to create the enabling conditions for empowerment and participation but fall short in requiring

demonstrable increases in representation. These findings support those of [Keen et al. \(2018\)](#), who in their review of blue economy rhetoric and literature in the Pacific region identify a neglect of issues of power, agency and gender. While there are weak links between the blue economy and the SDGs in these areas, [Keen et al. \(2018\)](#) argue that the SDGs themselves are restrictive in that they are based on traditional visions of economic growth and do not address the complexity and importance of local contexts and how these specifics, such as issues relating to gender, contribute to wellbeing and livelihoods. Our results echo this and indicate a lack of synergy between complex issues such as gender equality (SDG 5) and aims of blue economy policies. While our results show the importance of the international agenda to shape the overall vision for a blue economy, holistic sustainability such as that which addresses complex systemic issues like gender equality and empowerment, depends on tailored governance developed in response to local culture and capacity ([Esquivel and Sweetman, 2016](#); [Keen et al., 2018](#)). Blue economy policies should exist within a framework that sets the conditions required for holistic sustainability, that is flexible to respond to local contexts and changing conditions (such as those driven by a changing climate or other shocks), but firm enough to ensure internationally agreed norms cannot be ignored.

4.3. Key conditions for sustainability

Our results show how without local contextualisation such as can be achieved through participation and inclusion and framing as is provided by the SDGs, blue economies may not achieve aims of sustainability. This finding is supported elsewhere in the literature, where [Okafor-Yarwood et al. \(2020\)](#) show that the criteria for a successful blue economy hinge on comprehensive co-development of governance across all stakeholders to fully understand the consequences of an action across all scales. Our results support calls for robust stakeholder participation and indicate that capacity development to support the necessary transformation of governance to embrace trust and transparency, will be essential. A clear example of the importance of framing is provided by the blue economy aim of developing *Capacity and skills*, where interactions were found to be more likely to be positive when driven by progress towards the SDGs. In the absence of a sustainability framing, the blue economy aim of developing *Capacity and skills* may reach target populations and develop blue economies without contributing to aims of holistic sustainability. For example, this could focus on developing skills to participate in low-skill and low-wage employment within extractive industries rather than empowering entrepreneurship and innovation at a community level. Co-production of visions for blue economies will be essential to support ecologically and economically sustainable visions that subvert traditional interpretations that seek the quick economic wins of furthered extraction.

The aim of creating and advancing *Governance* strategies to support blue economies was assessed as being indivisible from progress towards the majority of SDGs. However, historic 'top-down' modes of governance could continue or exacerbate trends of exclusion and marginalisation of those dependent on marine resources at a local level. To avoid this, and address systemic issues such as gender inequality (SDG 5) and to implement all SDGs in accordance with human rights ([Human Rights Council, 2018](#)), capacity and skills development is necessary across all levels of society. At a local level, capacity development should empower actors within a blue economy to participate in its development and ongoing governance, and to equitably share in the benefits arising from its progression. *Capacity and skills* development is not only a requirement for those currently excluded but is also required in the spheres of policy making and regulation to support transformation that enables fair participation and the integration of knowledge and information into governance.

Participation and inclusion are also necessary to facilitate the cooperation needed to match governance with the temporal and spatial scales at which ecological processes and functions support biodiversity

health and ecosystem services. Ocean governance often focusses on discrete elements of the social-ecological system, such as a specific sector or resource (Rees et al., 2018; Stephenson et al., 2019). As an example, the mitigation of climate change is a critical issue for marine biodiversity and ecosystem services (Harrould-Kolieb, 2020; Lam et al., 2020) that underpin blue economies and is inextricably linked to the basic human rights to life, health and food (Morgera, 2020). However, policies do not cast blue economies as a vehicle driving the most pressing intervention to reduce ocean acidification, the mitigation and reduction of carbon dioxide emissions (Bindoff et al., 2019) (Appendix 1, Table A3). This is supported by results that indicate a weak interaction between blue economic aims and SDG 14.3 (which seeks to address the impacts of ocean acidification). A key factor limiting the mutual support of SDG 14.3 and the blue economy was identified as the lack of certainty in how ‘scientific cooperation’ translates to action that addresses the impacts of ocean acidification at a range of scales. At an international scale, action requires adherence to the Paris Agreement (United Nations, 2015b), as well as the guidance adopted under the Convention on Biological Diversity (CBD, 2014, 2012), and likely includes climate diplomacy to navigate the required reduction in carbon emissions to address the political stagnancy of the management of ocean acidification (Harrould-Kolieb, 2020). At this level, blue economy aims of maintaining and improving relations through *International cooperation* and developing operational, efficient and representative *Governance* could foster increased global climate ambition by setting the ocean and the profound risks of its acidification for society at the centre of climate change negotiations (Cooley et al., 2019).

While blue economy policies do not seek to actively address the threat of climate change to the health of ocean systems they recognise the importance of resilience and adaptation. In many cases demands to embed these principles will lead to blue economies developing in ways that safeguard the provision of ecosystem services and support progress towards the SDGs such as through improving water quality (SDG 8.4, 12.2, 14.1), sanitation (SDG 6), promoting the restoration of crucial marine habitats (SDG 14.2) and reducing overfishing (SDG 14.4). While the resilience of natural systems will be essential for local blue economies to respond to climate change, it is also important that planning considers the societal changes associated with restrictions on emissions. For example, tourism is a linchpin for many development strategies and blue economy policies (Patil and Diez, 2016; Roberts and Ali, 2016; Rustomjee, 2017). The vulnerability of the tourism industry to future emissions constraints will need to be considered. The consequences of potential reduction in travel and tourism were highlighted during the COVID-19 pandemic, where international movement was rapidly curtailed undermining many economies based on tourism (Deb and Nafi, 2020; Rogerson and Rogerson, 2020; Škare et al., 2020). Resilience to shocks such as the COVID-19 pandemic will be essential for the sustainable interpretation of a blue economy to avoid set-backs to progress towards the SDGs (Mukarram, 2020) that have been shown to disproportionately affect historically disadvantaged groups defined by gender, race, occupation, earnings and location (Rogerson and Rogerson, 2020).

5. Conclusion

The aims of blue economy policy and the SDGs are broadly synergistic, yet there are areas of divergence that risk the progression of a blue economy independently of visions of sustainability. These weak spots that allow extractive interpretations to proliferate, arise where definition of concepts or aims are ambiguous and as a result of poor understanding of how sustainability creates value within society. Our results highlight the importance of context and framing for sustainability and suggest that comprehensive participation and inclusion, such as through co-production, is necessary. A drive for both sustainability and blue economies was found to be strong at an international scale and our results indicate that challenges exist in channelling this influence towards

actions on the ground. Co-production, whilst currently poorly supported by blue economy aims, could respond to cross-jurisdictional issues, such as climate change and the management of ecosystem services which underpin society and human well-being, and therefore thriving blue economies. The robust participation and inclusion inherent to co-production would provide the context and framing to ensure that blue economies respect human rights and support a version of sustainability at all levels of society, particularly for those closely dependent on marine resources and space. Capacity development at all levels of society will be required to enable a transformation of governance so that it is adaptive and can respond to the needs of those enacting and affected by the progression of blue economies.

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CRedit authorship contribution statement

HJN: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Visualisation, Project administration. **SR:** Conceptualization, Investigation, Writing – review & editing, Project administration, Funding acquisition. **EM:** Investigation, Writing – review & editing, Funding acquisition. **DLP, AMSNL, SL, KM, TM, PNM, IOY, KOC, TW:** Investigation, Writing – review & editing. **NCB, TB, DD:** Investigation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.envsci.2022.01.001.

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