The Blue Economy and the United Nations' sustainable development goals: Challenges and opportunities

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A B S T R A C T

The "Blue Economy (BE)" is an increasingly popular concept as a strategy for safeguarding the world's oceans and water resources. It may emerge when economic activity is in balance with the long term capacity of ocean ecosystems to support the activity in a sustainable manner. Importantly, the concept of BE posits the inherent conflicts between two discourses—growth and development, and protection of ocean resources. The inherent conflicts require solutions to embrace the opportunities associated with the ocean economy while recognizing and addressing its threats. The potential solutions on a global scale are advocated by the United Nations in their Sustainable Development Goals (SDGs). However, we notice that the identification of the scope and boundaries of the BE in line with the UN's SDGs is vague even challenging, and the key stakeholders and their interests and roles in the BE are also vague. This review examines the scientific evidence of the association between the BE and the UN's SDGs, and relevance and alignment of stakeholders on the link between the BE and SDGs. Based on a literature survey between 1998 and 2018, we find that BE is highly associated with SDGs 14–17. Notably, we find that stakeholders prefer SDG 3 Good Health & Well-Being and SDG 8 Decent Work & Economic Growth in the BE context. As stakeholder involvement shows some differences and variations in the relationship between the BE and SDGs, we consider that stakeholders can play some roles directly or indirectly in the BE-SDGs context. In order to set achievable goals and targets in BE-SDGs, we support that key stakeholders should be identified to play several important roles in prosperous economic, societal development and setting tolerable ranges for the ocean biosphere.

1. Introduction

In the recent decade, the "Blue Economy (BE)" or "Oceans/Marine Economy" has been widely advocated by an array of interested parties as a concept or a strategy for safeguarding the world's oceans and water resources. The concept of BE is originated from the United Nations Conference on Sustainable Development held in Rio de Janeiro in 2012 (UNCTAD, 2014). The term 'Blue Economy' has been used in different ways and similar terms such as "ocean economy" or "marine economy" are used without clear definitions. In a concept paper, the United Nations offered general definition of the "Blue Economy" as an ocean economy that aims at "the improvement of human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (UN, 2014, p.2)". More recently, the World Bank defined the "Blue Economy" as "the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem (World Bank 2017, p.6)." The World Bank's

definition is a comprehensive concept embracing multi-aspects of oceanic sustainability ranging from sustainable fisheries to ecosystem health and preventing pollution. Importantly, the definition itself requires collaboration across borders and sectors through various partnerships and stakeholders. Yet, different stakeholders will favour particular focuses or interpretations of the definition to meet their own purposes. It implies that some potential conflicts or problems may arise due to different stakeholders' preferences or interests (Voyer et al., 2018).

Undoubtedly, the stable functioning of the Earth systems is a prerequisite for a thriving society and sustainable development. In Europe, major research initiatives supported the Marine Investment for the Blue Economy and H2Ocean projects. These projects have focused on the developments of multiple-use platforms and new production techniques for a range of industries including aquaculture, marine renewable energy, tourism, recreation, and maritime transport. Through the Blue Economy EU support scheme, Ireland has been a front runner in these

development; China has identified the need to shift production systems offshore and the East China Sea Fisheries Research Institute is tasked with the development of offshore aquaculture; and New Zealand and Chile are both embarking on offshore aquaculture under the Blue Economy (FAO, 2018; Potts et al., 2016).

As Voyer et al. (2018) pointed out, the Blue Economy sits in two competing ways—opportunities of growth and development and threatened and vulnerable spaces in need of protection. The inherent conflicts between these two debates require solutions to embrace the opportunities associated with the ocean economy while recognizing and addressing its threats. In the context of blue economy, the United Nations' Sustainable Development Goals (SDGs) imply that economic development is both inclusive and environmentally sound, and highlight the need to balance the economic, social, and environmental dimensions of sustainable development in relation to oceans (Griggs et al., 2013). The United Nations has declared 2021 to 2030 as the 'Decade of Ocean Science for Sustainable Development' to support efforts to reverse the cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework. This framework aims to ensure ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean. In relation to oceans, the World Bank lays particular emphasis on 'balancing the triple bottom lines of sustainable development' as a key component of the BE (World Bank, 2017, p.4). However, it is not easy to reach a balance in practice given that the conditions of the oceans have drastically declined due to human and industrial activities and often conflicting goals, ranging from pollution to unsustainable fishing and biological degradation (United Nations, 2016).

As the concept of BE is rooted in several different disciplines (such as geo-economics, politics, economics, social and cultural studies), we notice that the development ideas cross ecology and planetary boundaries, with tipping points giving a new sense of urgency for reassessing the environment and economy and revaluing the marine/biological-economic relationship worldwide. In particular, linking BE to the UN's SDGs is challenging, especially when there are potential competitions or conflicts between individual or industrial goals such as fossil fuel-based carbon emission reductions and energy provision. The SDGs and related 17 goals, 169 targets and 232 indicators result from a multi-stakeholder agreement between countries, designed to reduce unsustainability and promote sustainable development globally (United Nations, 2018). However, the identification of the scope and boundaries of the BE in line with the UN's SDGs is vague, even challenging. More importantly, the key stakeholders and their interests and roles in the BE are relatively vague. To set appropriate and achievable goals and targets, the key stakeholders have to be identified so as to enable prosperous societal development and to set tolerable ranges for the biosphere.

This research seeks to address the challenges and identify opportunities for future inquiry. In order to identify the key stakeholders and scope/boundaries of the BE in line with the UN's SDGs, this research attempts to provide some evidence to fill the gap between key stakeholders and the "Blue Economy" in the context of the UN's SDGs. The outcomes of the research suggest some key areas of development and future directions.

2. Identifying current status and key stakeholders of the BE and the UN's SDGs

In order to identify the current status and key stakeholders of BE in the context of the UN's SDGs, we undertook a systematic review and conceptual analysis of the academic literature that specifically included these two key constructs (i.e., blue economy and sustainable development goals). The review and conceptual analysis followed two main steps: first, we developed a database by undertaking a comprehensive and systematic search to identify and extract all the relevant literature in relation to BE-UN's SDGs published in peer-reviewed academic

journals in the field during the past two decades. Second, a content analysis and the results were presented.

3. Development of the database and content analysis

The initial step comprised identification of the relevant research. In order to make a comprehensive literature review, we set the following criteria for our database (Table S1 and S2 in Appendix):

- Database: Scopus
- Search conditions:
- English-language journal articles
- Peer-reviewed journals only (excluding book chapters, conference proceedings)
- Time period: 1998–2018 (20 years)
- Search strings:

Approach 1: ("Ocean Economy, Blue Economy") AND "Sustainable Development Goals"

Approach 2: (("Ocean Economy, Blue Economy") OR "Sustainable Development" OR "Sustainable Development Goals") AND "Stakeholders"

Based on the above search conditions, we conducted a search for keywords within the title, abstract, and keywords of the peer-reviewed journals, and repeated the search for the two search strings. Since the terms "ocean economy" and "blue economy" are used interchangeably in the literature, we included ocean economy and blue economy in our keywords search. Furthermore, we specifically included 'sustainable development goals' instead of 'sustainable development' to specifically focus on the UN's SDGs. Notably, we conducted two stages of keywords searches (Approach 1 and 2) to identify 'stakeholders' involvement in BE-UN's SDGs (Table 1).

In the first search, we found only 26 papers from 18 journals (Amengual and Alvarez-Berastegui, 2018; Bennett, 2018; Carr and Liu, 2016; Ehlers, 2016; Fraschetti, 2018; Granit et al., 2017; Hassler, 2018; Hays, 2016; Hemer et al., 2018; Islam and Shamsuddoha, 2018; Lent and Squires, 2017; Niner et al., 2017; Ntona and Morgera, 2018; Retzlaff and LeBleu, 2018; Salpin et al., 2018; Sarà et al., 2018; Stead, 2018; Sun et al., 2017; Taylor, 2012; Thiele and Gerber, 2017; Thompson et al., 2018; Virto, 2018; Visbeck, 2014; Waiti and Lorrenij, 2018; Winder and Le Heron, 2017; Yang et al., 2016). As Fig. 1 shows, the BE and SDGs appeared very recently. As shown in Table 1, *Marine Policy* published the highest number of publications (8) addressing the link between BE and SDGs, followed by *Frontiers in Marine Science* (2 publications). Clearly SDGs have emerged as the lexicon of science literature in the context of BE. This indicates that the link BE-SDGs open a new dialogue to explore how scientists from natural and social disciplines solve the grand challenges of sustainable development.

As stakeholders have gained recognition in the scientific literature, recognising the relevant or key stakeholders in BE-SDGs is important for considering 'how' and 'to what extent' questions to investigate. As Eikeset et al. (2018) suggested, we focus on key stakeholders who have some direct influence as well as immediate interest. Different stakeholders have varying interests and independent expectations and therefore have substantially different roles in their relationships to specific SDGs in the context of BE. They could potentially be part of a solution to achieving BE thereby contributing to SDGs.

To identify the key stakeholders, in the second search with a focus on stakeholders, we found only 27 papers in 15 journals (Botero et al., 2016; Carr and Liu, 2016; Christie, 2017; De Santo, 2013; Domínguez-Tejo et al., 2018; Eikeset et al., 2018; Elliott et al., 2017; Ferreira et al., 2018; García-Quijano, 2009; Granit et al., 2017; Hassler, 2018; Hemer et al., 2018; Islam and Shamsuddoha, 2018; Kamat, 2018; Kern and Söderström, 2018; Lundberg, 2013; Malone et al., 2014; Ntona and Morgera, 2018; Portman, 2014; Retzlaff and LeBleu, 2018; Russel et al., 2018; Stead, 2018; Sun et al., 2017; Văidianu and Ristea, 2018; Virto,

Table 1
Overview for the journals which published the studies of BE-SDGs (App. 1) and BE-SDGs-Stakeholders (App. 2); number of publications of productive journals identified under the App. 1 and App. 2 and basic journal statistics showing the impact factor of the journal in 1998 (IF-1998) and 2018 (IF-2018), citations per document (C/D) for 2016–2018, and h-index.
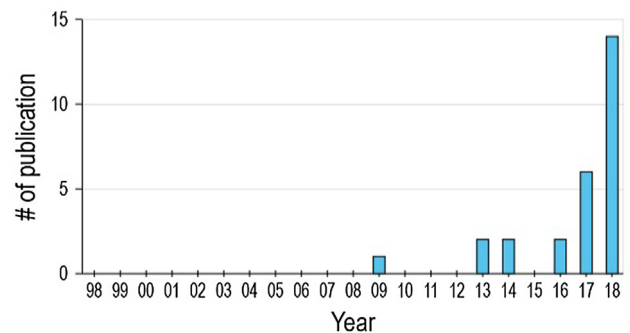
No.	Journal title[1]	Number of publication			Journal statistics[2]			
		Total	App. 1	App. 2	IF-1998	IF-2018	C/D (3 yrs)	h-index
1	J. Clean. Prod.	13,420	–	1	–	6.395	7.358	150
2	Hydrobiologia	9,829	1	–	0.576	2.325	2.367	125
3	Renew. Energ.	9,229	1	1	0.102	5.439	6.207	157
4	Mar. Pollut. Bull.	8,874	–	2	1.317	3.782	4.102	147
5	J. Environ. Manage.	7,706	–	2	0.583	4.865	5.384	146
6	Biol. Conserv.	6,488	1	–	1.102	4.451	5.307	173
7	Sustainability (Switzerland)	5,975	1	–	–	2.592	3.029	53
8	Ecol. Indic.	4,704	–	1	–	4.490	5.157	97
9	Deep-Sea Res. PT. II	4,060	1	–	1.247	2.430	3.229	127
10	Mar. Policy	3,098	8	8	0.432	2.865	3.113	48
11	Trends Ecol. Evol.	2,844	1	–	7.911	15.236	15.273	312
12	Ocean Coast. Manage.	2,614	1	3	0.147	2.595	3.306	70
13	Environ. Sci. Policy	2,178	1	2	–	4.816	5.689	95
14	Aquat. Conserv.	1,593	1	–	0.534	2.935	3.165	69
15	Front. Mar. Sci.	1,397	2	–	–	3.086	3.242	28
16	Water Policy	1,278	1	1	–	1.011	1.092	50
17	Curr. Opin. Env. Sust.	850	1	1	–	4.258	5.968	69
18	Hum. Organ.	798	–	1	0.475	0.585	1.020	48
19	Environ. Hist.	678	1	–	0.750	0.525	0.542	33
20	Int. J. Tour. Res.	610	1	1	–	2.278	3.411	43
21	Dialogues Hum. Geogr.	360	1	1	–	3.875	2.886	23
22	J. Plan. Lit.	304	1	1	–	2.125	4.533	49
23	WMU J. Marit. Affairs	288	1	–	–	0.837	1.067	14
24	J. Ecotourism	275	–	1	–	2.429	2.386	31
Subtotal		89,450	26	27	*Mean*	1.265	3.593	4.118	90

  [1] Given in journal abbreviations,
  [2] Referred in JCR (Journal Citation Report, https://jcr.clarivate.com) and SJR (Scimago Journal & Country Rank, https://www.scimagojr.com/).
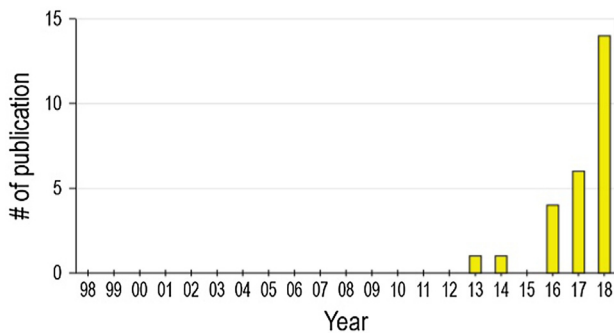
Fig. 1. The performance of the Blue Economy-SDGs (App. 1) publications from 1998 to 2018. A total of 26 publications in 18 journals are included. *Marine Policy* published the highest number of publications (*n* = 8) addressing the link between BE and SDGs, followed by *Frontiers in Marine Science* (*n* = 2). Details refer to Table 1 and Table S1. (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 performance of the Blue Economy-SDGs-Stakeholders (App. 2) publications from 1998 to 2018. A total of 27 publications in 15 journals are included. *Marine Policy* published the highest number of publications (*n* = 8) addressing the link among BE, SDGs, and Stakeholders followed by *Ocean and Coastal Management* (*n* = 3). Details refer to Table 1 and Table S1. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

2018; Walker and Weiler, 2017; Winder and Le Heron, 2017). As Fig. 2 shows, the BE-SDGs linked with stakeholders were addressed very recently. Table 1 shows that *Marine Policy* published the highest number of publications (8) addressing the link between BE-SDGs and stakeholders, followed by *Ocean and Coastal Management* (3 publications). When we specify the stakeholders in BE-SDGs, we find substantial differences between our first and second search approaches.

3.1. Development of BE-SDGs and BE-SDGs-Stakeholders in scientific research

We summarize BE-SDGs and stakeholder-involved BE-SDGs respectively in Figs. 3 and 4. First, the findings of BE-SDGs link in Fig. 3 show that the BE is highly linked to SDGs 14–17. As the BE directly addresses global ocean and water resources, it is not surprising to find that SDG

14 Life Below Water is the highest goal of SDGs. Interestingly, SDG 6 Clean Water & Sanitation is not highly associated with BE while SDG 15 Life On Land and SDG 12 Responsible Consumption & Production are highly linked to BE.

Our literature search revealed that the top five most frequently included stakeholders. Table 2 summarizes the key stakeholders in BE-SDGs. When we consider that international organizations (UN, UN-CTAD, and World Bank) are currently leading and accelerating policy development and dialogue between nations, it is not surprising that government agencies and policy makers are the most frequently included stakeholders. The non-governmental organizations (NGOs) are also actively involved in the dialogue and policy development between nations. But local communities or societies are a relatively minority stakeholder group in BE-SDGs.
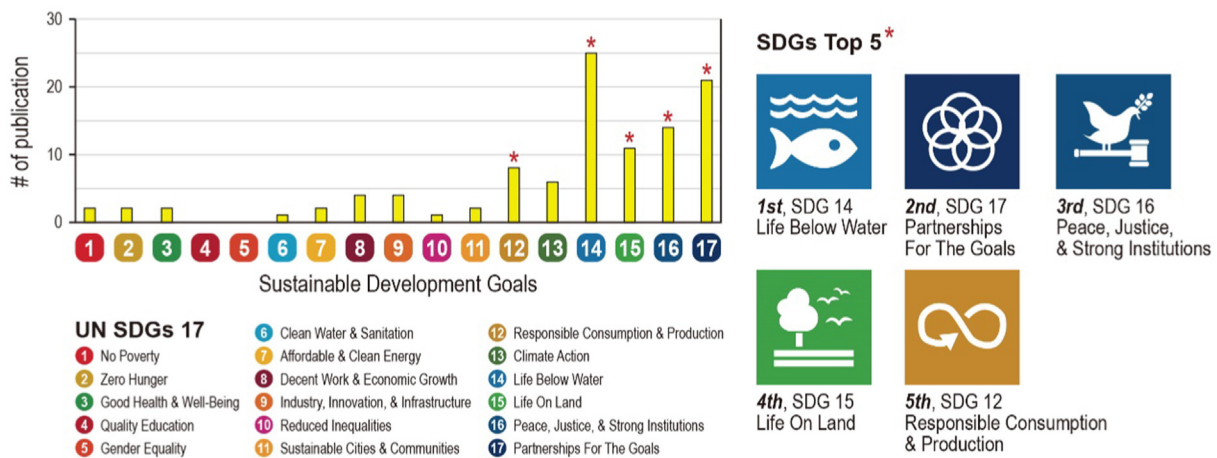
Fig. 3. The identified SDGs link to the Blue Economy (1998 – 2018). Asterisk at the above yellow bars represents the top 5 (right) of the UN SDGs 17. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Focusing on stakeholders in BE-SDGs, we found similar trends together with some differences between Figs. 3 and 4. As Fig. 4 shows, SDGs 14–17 are highly linked to BE while SDG 3 Good Health & Well-Being is one of the top five frequently linked goals to BE. When we compare the rest of SDGs goals, we also find that stakeholders involvement in BE-SDGs show several interesting differences: stakeholders prefer SDG 3 Good Health & Well-Being and SDG 8 Decent Work & Economic Growth while no stakeholder involved in the spectrum in the BE-SDGs prefers SDG 12 Responsible Consumption & Production and SDG 13 Climate Action.

The call for active participation among these stakeholders is highlighted in a number of areas for a wide response to the marine environmental issues and a sustainable development within the marine space in relation to the SDGs. The special issues of HELCOM on eutrophication in the Baltic Sea (HELCOM, 2009, 2010) is a good example of an active, scientific body working for a common consensus among stakeholders in its field. Lundberg (2013) exhorted in a paper on the eutrophication issue of Baltic Sea that a holistic and sustainable way of action by cooperating with all stakeholder groups and governance levels is needed and the carrying capacity of the Baltic Sea ecosystem has to be the common priority. In the same context, for the marine spatial planning (MSP) in Romania, Văidianu and Ristea (2018) endorse a call for key institutions and actors involved in MSP implementation to actively engage the impacted stakeholders and communities at all levels from local to national. Above all, the process has to be based on public

Table 2
The top five most frequently stated stakeholders in BE-SDGs identified by the App. 2. Frequency indicates the number of publications linked to corresponding stakeholders in total and three top SDGs (14; Life Below Water, 17; Partnerships For The Goals, and 16; Peace, Justice, & Strong Institutions, in the order).

Rank	Stakeholders	Frequency			
		Total	SDG 14	SDG 17	SDG 16
1	Government Agencies/ Policy Makers	14 (52%)	12 (56%)	11 (55%)	9 (60%)
2	NGOs	12 (44%)	11 (50%)	10 (50%)	6 (40%)
3	Scientists/Researchers	10 (37%)	8 (36%)	9 (45%)	6 (40%)
4	Businesses/Industries	7 (26%)	6 (27%)	6 (30%)	4 (27%)
5	Local Community/Society	4 (15%)	3 (14%)	3 (15%)	3 (20%)
–	Unclear	9 (33%)	8 (36%)	7 (35%)	6 (40%)
Total		27	22	20	15

participation, the establishment of governance rules, and transparent regulations with frequent communication.

Clearly, the concept of the "Blue Economy" is linked to UN's SDGs with some priorities (SDG 14, 15, 16 and 17). As stakeholder involvement shows some differences and variations in SDGs, we consider that stakeholders can play some roles directly or indirectly in the BE-SDGs context. As our results show, limited SDGs goals are closely associated with BE, but it is not clear that the rest of the SDGs are irrelevant to BE. When we consider that the focus of BE is on integrated management
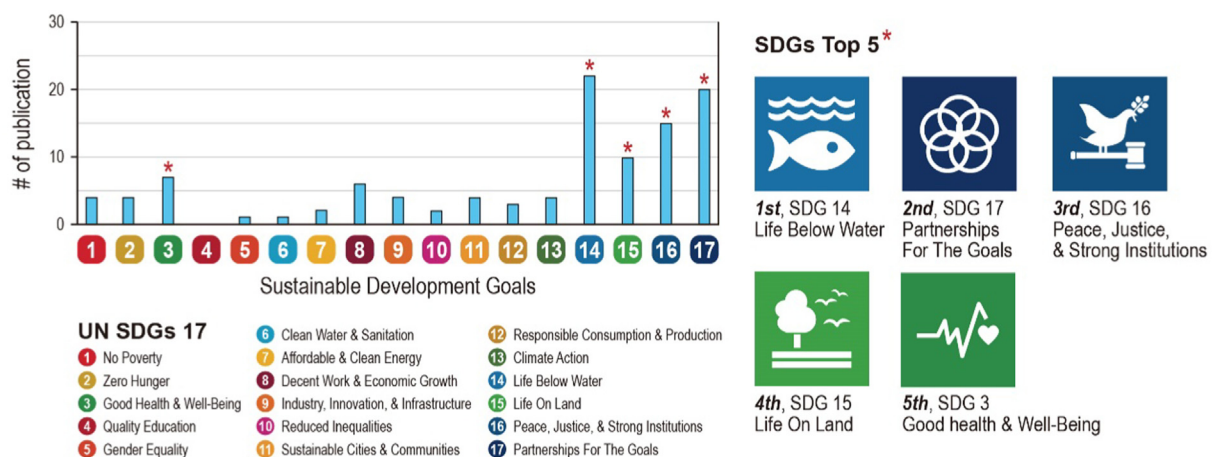

Fig. 4. The stakeholder-focused SDGs link to the Blue Economy (1998 – 2018). Asterisk at the above blue bars represents the top 5 (right) of the UN SDGs 17. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

and multi-aspects of SDGs which aim to manage across sectors and geographical scales, the scope and boundaries of BE remain underdeveloped, but is highly likely to be critical issues for future development. To this end, we expect that key stakeholders and actors can play important roles in identifying the scope and boundaries of BE and implementing and developing the related tools and activities related to the UN's SDGs.

4. Concluding remarks and future inquiry

This paper shows increasing interest as well as diverse outlets, demonstrating the complexity and diversity of the "Blue Economy" field in relation to the UN's SDGs.

The concept of the BE and its link to the UN's SDGs offers a way to develop locally grounded but globally scaled directions. Most studies from our literature review focus on separate and salient issues, ignoring interdependencies between the BE and SDGs. 'Seeing the forest and the trees' can change how researchers view the BE-SDGs link to solve complex interconnected challenges. Because the roles of key stakeholders such as industry are less obvious and policy frameworks less supportive, and more complex than the straightforward dominance of economic and environmental interest, the BE opens a dialogue for development and implementation towards the UN's SDGs. Moving forward, more research and inquiry are needed to identify key stakeholders' and actors' expectations in each SDG in the BE context, and the scale and scope of BE, and perhaps to broaden its terms to meet stakeholders' and actors' expectations. This first articulation is a preliminary contribution, intended to open a new avenue of inquiry for the blue economy science and sustainable development research.

When stakeholders' alignment with BE-SDGs link is clear, the levels of uncertainty and the negative effects of misalignment or conflicting goals can be reduced or controlled. A pragmatic solution to addressing the complexities of the BE-SDGs link may suggest that an incremental approach be adopted by key stakeholders based on the perceptions of which SDGs are material. However, there are also the issues of 'time (short vs. long term)' and the 'levels of commitment and interest' of key stakeholders in the BE-SDGs association. That is, the grand aim of the SDGs by the year 2030 is relatively of a short time period to end all forms of poverty while protecting the planet and building economic growth. To achieve SDGs in practice, we should reconsider the current approaches in BE which we call for future inquiries.

For future inquiries, we recommend to explore (i) how the BE is conceived or interpreted by different stakeholder groups; (ii) how the scope and scale of the BE are defined; (iii) how to align stakeholders' and actors' expectations with the scope and scale of BE in the SDGs context; (iv) a realistic timeline to operationalise the UN's SDGs in the BE context; (v) productive approaches to reflect stakeholders' and actors' expectations and interests in BE's scopes and activities; and (vi) efficient and effective communication tools among stakeholders (policy makers, NGOs, industries, scientists, local communities, and general public) in BE-SDGs. We encourage researchers interested in the BE and SDGs to apply and further extend stakeholder alignment in their quest to provide better understanding and solutions for the world's most pressing problems.

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. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.envint.2020.105528.

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