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Beneath the Surface of the First World Ocean Assessment: An Investigation Into the Global Process' Support for Sustainable Development

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The United Nations' 2030 Sustainable Development Goals have articulated sustainable development requirements at the international level. SDG14: life below water, has in particular, provided a future pathway for sustainable development of the ocean environment. With the establishment of this global perspective has come a renewed emphasis on the need for global ocean knowledge production. The 2015 First World Ocean Assessment (FWOA), which was produced by the first cycle of the United Nations' Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socio-economic Aspects, is widely viewed as a primary tool to guiding action on SDG14. This research investigates how effective the FWOA has been at supporting these efforts toward sustainable development of the ocean environment. We use a combination of approaches, including document mining, an internationally distributed survey and semi-structured interviews to better understand the impact of the FWOA as well as the interrelated functioning of the Regular Process' first cycle. While the FWOA was successful in compiling well accepted and credible ocean information, it was unable to generate the impact on sustainable ocean management activities that had originally been expected of it. Funding restrictions, participation issues and political anxieties seemed to derail the first cycle of the Regular Process from initial recommendations and directed the process into unorthodox operations and substantial political control. With the Second World Ocean Assessment (SWOA) well underway, it is imperative that trust is built and social learning is encouraged between participants in the Regular Process.

Keywords: global environmental assessments (GEA), United Nations' Regular Process, marine governance, sustainable development goal 14 (SDG14), First World Ocean Assessment

INTRODUCTION

Twenty-first century global environmental change is threatening to dramatically interfere with advancements in human wellbeing (Dirzo et al., 2014; Hashim and Siri, 2016). Political decision-makers are increasingly recognizing the need to understand this environmental change and the complexities that arise from it across social and economic bounds (Clark et al., 2006).

This has fostered a need for synthesized global environmental data that will support informed decision-making (Mauser et al., 2013). Global environmental assessments (GEAs) are international social processes that compile, analyze and communicate information pertaining to environmental phenomena at the planetary level, with the aim of releasing findings publicly and informing decision-making processes (Farrell et al., 2001; Miller, 2001; Clark et al., 2006; Rothman et al., 2009; Kowarsch et al., 2016).

In 2002, the United Nations General Assembly (UNGA) endorsed the establishment of the Regular Process for Global Reporting and Assessment of the State of the Marine Environment including Socio-economic Aspects (United Nations General Assembly [UNGA], 2003a). The First World Ocean Assessment (FWOA), which was released in 2015, was the first report produced by the Regular Process and perhaps the most extensive GEA of the marine environment ever conducted. The Second World Ocean Assessment is well underway and is due to be published in 2020 (United Nations General Assembly [UNGA], 2018). While these assessments and the Regular Process itself have been embedded within a sustainable-development context (World Summit on Sustainable Development, 2003; United Nations, 2016, 2017c; United Nations General Assembly [UNGA], 2017), the degree to which they can be said to influence the Sustainable Development Goals (SDG's) and particularly SDG14: Conserve and sustainably use the oceans, seas and marine resources, is ambiguous. This research aims to address this gap, by investigating how effective the FWOA has been at influencing sustainable development activities in the marine environment and by making recommendations for future such processes and outputs.

Global Environmental Assessments

Global environmental assessments have become an important tool to inform decision-making in the international environmental governance arena (Jabbour and Flachslund, 2017). Evaluating the effectiveness of prominent GEAs such as the IPCC and IPBES has been the subject of extensive work in the scientific literature (Mitchell et al., 2006; Leemans, 2008; Hulme and Mahony, 2010; Beck et al., 2014; Brooks et al., 2014; Retief et al., 2016; Garard and Kowarsch, 2017; Löfmarck and Lidskog, 2017). Much of this work has highlighted that GEA influence largely depends on audience perceptions of them (Mitchell et al., 2006). Audiences tend to place emphasis on three attributes of an assessment; credibility, legitimacy and salience (Cash and Clark, 2001; Clark et al., 2002; Mitchell et al., 2006; Rothman et al., 2009; United Nations General Assembly [UNGA], 2009; Alcamo, 2017). Credibility refers to perceptions of the scientific and technical procedures of an assessment and is driven by the degree to which an audience believes an assessment and its findings are worth trusting (Eckley, 2001). Legitimacy refers to an audience's perception of the rules, regulations and processes that structure social aspects of the assessment and is driven by the degree to which an audience perceives the assessment and its process as fair (Cash et al., 2003). Salience or relevance is the degree to which the information produced relates and is potentially

applicable to audience concerns (Eckley, 2001; Clark et al., 2006). Salience is extremely dependent on the characteristics of the audience and may be driven by the geographic scale at which information is provided, the geographic scope of information, the temporal range of information, the thematic scope and the timeliness of assessment production (Clark et al., 2002; Cash et al., 2003). Furthermore, audience perceptions of a GEA, and thus its influence, are directly tied to the process through which that GEA is generated (Mitchell et al., 2006). The chances that a target audience will perceive an assessment as credible, legitimate and salient tend to improve when the assessment process involves the co-production of knowledge (Mitchell et al., 2006).

Knowledge co-production is the engagement of stakeholders, decision makers and researchers to collectively design, structure and undertake research (van der Hel, 2016). Co-production involves empowering potential knowledge users from across institutional, sectoral, cultural or disciplinary bounds (Mauser et al., 2013). Recently, the global sustainability community has emphasized knowledge co-production as an important pathway toward the UN Sustainable Development Goals as well as sustainable development of the marine environment (Mooney et al., 2013; Clark et al., 2016; International Oceanographic Commission [IOC], 2017; Miller and Wyborn, 2018). The Future Earth research platform, which was established at the 2012 United Nations Sustainable Development Conference in Rio de Janeiro, aims to support global sustainable development efforts by promoting global environmental research that is both co-designed and co-produced (Future Earth, 2013). Future Earth defines co-design as an initial stage to co-production where stakeholders, decision makers and researchers collectively identify research questions and frame the direction of research projects (Future Earth, 2013). These principles have been taken forward in a range of core projects and knowledge action networks across a variety of domains, including coasts (Future Earth Coasts, 2018).

Comprehensive and systematic reviews of co-designed and co-produced research activities have revealed a strong potential for these approaches to foster processes and outputs that are more influential for target audiences than traditional approaches (Mitchell et al., 2006; Mauser et al., 2013). For instance, the participation across disciplinary, sectoral, cultural and geographic boundaries can manifest perceptions of process legitimacy, while also bolstering product quality and credibility by allowing a greater diversity of knowledge types to be included (Mauser et al., 2013). Second, sharing control over the direction of research with potential knowledge users can improve assessment saliency by allowing those users to tailor products to their specific context and facilitate solution development (Lemos and Morehouse, 2005). Third, this joint power-arrangement necessitates deliberation to overcome points of divergence, which can often facilitate capacity building and social learning between the participants (Mitchell et al., 2006; van Kerkhoff and Lebel, 2015). Finally, co-designed and co-produced research can improve networking, by broadening participation and improving communication and coordination between participants. This networking has the potential to

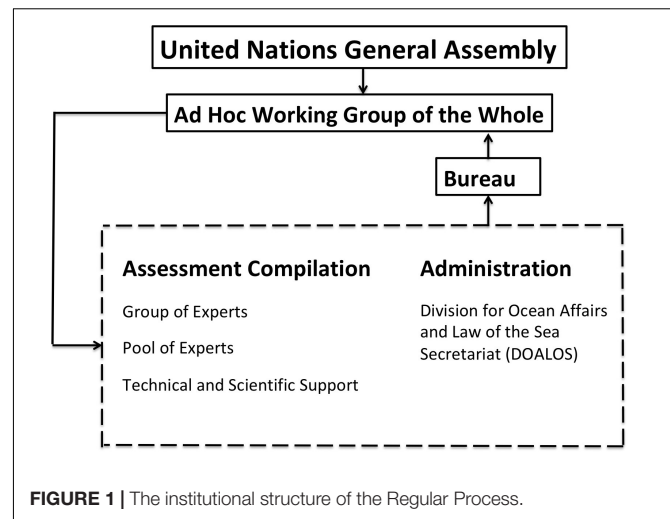
provide knowledge products with greater access to policy-making environments (Moser, 2016) or provide decision makers with more access to expertise and advice.

The First World Ocean Assessment

In 2002, the UNGA endorsed recommendations at the World Summit on Sustainable Development in Johannesburg to establish a Regular Process for the Global Reporting and Assessment of the Marine Environment, including socio-economic aspects (United Nations General Assembly [UNGA], 2003a). In 2005, the UNGA formalized plans to conduct an Assessment of Assessments in preparation for establishing this Regular Process (United Nations General Assembly [UNGA], 2005). In September of 2009, after reviewing nearly 1200 ocean assessments from the local to the global scale and across various thematic subjects, the Group of Experts tasked with the investigation released the Assessment of Assessments (United Nations General Assembly [UNGA], 2009). This work identified best practices of assessment methodology, current marine assessment gaps and capacity building needs in developing countries. Together this information served as the basis from which the Group of Experts made their recommendations on the operational design of the Regular Process (United Nations General Assembly [UNGA], 2009; United Nations, 2016).

The Regular Process is charged with the objective of reviewing “the state of the marine environment, including socioeconomic aspects on a continual and systematic basis by providing regular assessment at the global and supraregional levels and an integrated view of environmental, economic and social aspects” (United Nations, 2016). Its output assessments are compiled at individually established intervals and are intended to “support informed decision-making” and “contribute to managing in a sustainable manner human activities that affect the oceans and seas in accordance with international law” (United Nations, 2016). While, contributing to SDG14, was not part of the official objective for the FWOA, comments from numerous UN organizations, agencies and the secretary general suggests that the Regular Process intended to support efforts on SDG14 with the publication of the FWOA (United Nations, 2016, 2017c; United Nations General Assembly [UNGA], 2017; United Nations Economic and Social Commission for Asia and the Pacific, 2018).

Figure 1 provides an overview of the institutional architecture during the first cycle of the Regular Process. In summary, the Regular Process is overseen by the UNGA through its *Ad Hoc Working Group of the Whole* (United Nations, 2016). Like the larger UNGA, this body is composed of UN member state representatives, however, relevant UN agencies and ECOSOC registered NGOs can also attend meetings and voice concerns. The Bureau of the *Ad Hoc Working Group of the Whole* is a subordinate body, which developed part way through the first cycle, and takes managerial decisions between sessions of the *Ad Hoc Working Group of the Whole* (United Nations, 2016). The bureau comprises representation from 15 UN member states, including three from each UNGA regional group. The assessment compilation in the Regular Process is led by the Group of Experts with additional contributions from the Pool of



Experts as well as technical and scientific support from relevant intergovernmental organizations like UNEP and IOC/UNESCO (United Nations, 2016). Members of the Group of Experts are nominated by UNGA regional groups, each of which has five possible nominations. Members of the Pool of Experts are nominated by member states through the coordination of UNGA regional groups (United Nations, 2016). The secretariat of the Division for Ocean Affairs and Law of the Sea (DOALOS) provides administrative support for coordinating all activities related to the Regular Process (United Nations, 2016).

The 2015 FWOA aimed to establish a baseline compilation of global ocean information (United Nations, 2016). It was developed by the first cycle of the Regular Process, which commenced in 2010 (United Nations, 2016). In this first cycle, there were a total of 22 experts nominated to the Group of Experts and approximately 600 individuals nominated to the Pool of Experts. Eight regional workshops were organized in Chile, China, Belgium, United States, Australia, Côte d’Ivoire, and India to consider the scope of the FWOA, identify relevant information to include from each region and identify capacity gaps¹ (United Nations, 2016).

The final printed FWOA publication comprised a total of 973 pages, 55 chapters and 7 parts. These parts included a summary document, an overview of its context, an assessment of the major ecosystem services from the marine environment, an assessment of food security and food safety, an assessment of other human activities related to the marine environment, an assessment of biological diversity and habitats and an overarching assessment of the value of the ocean and human impacts on the ocean (United Nations, 2016). The FWOA identified 10 dominant themes, which were captured by the assessment. These include the negative impacts of climate change on marine environments, the unsustainable exploitation of living marine resources, the

¹During the first cycle of the Regular Process, the secretariat began a capacity building inventory, which lists both capacity needs as well as capacity building opportunities. The inventory may be added to by states, intergovernmental organizations and non-governmental organizations. Updates to the inventory have continued into second cycle.

high importance of sustainable fish capture for food security, the increasing pressure on marine biodiversity, the potential for spatial conflicts as ocean use increases, the inevitability of continued pollution and nutrient loading from increasing coastal population and agricultural production, the increasing risk that cumulative human impact has on marine ecosystem resilience, the uneven global distribution of ocean drawn benefits, the increasing need for coherent ocean management and the mounting risk associated with delaying solution implementation. In 2017, the Group of Experts also produced three technical abstracts at the request of the UNGA. These were focused on the 'Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction,' the 'Ocean and the United Nations Sustainable Development Goals under Agenda 2030' and the 'Impacts of Climate Change and Related Changes in the Atmosphere on the Oceans' (United Nations, 2017a,b,c).

International Ocean Governance and Sustainable Development

In 2014, the oceans were allocated a specific Sustainable Development Goal; SGD14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development (United Nations General Assembly [UNGA], 2015b). This 2030 sustainable development agenda recognizes and emphasizes the importance of collective action for addressing transformations to more sustainable futures (United Nations General Assembly [UNGA], 2015b). For SDG14 specifically, this will require cooperation and organization from the many actors in the ocean governance arena (Figure 2). Formally, this includes the nine IGOs (UNEP, IOC/UNESCO, FAO, IMO, DOALOS, Ramsar Convention, ILO, IUCN and UNEP-WCMC) that were identified as possible partner or custodian agencies for SDG 14 as well as the central implementing authorities of the agenda: national governments (United Nations General Assembly [UNGA], 2015b; Inter-Agency, and Expert Group on SDG Indicators, 2019). Thus, for the Regular Process to effectively contribute to SDG14 and fulfill its stated objective, it must engage with and produce relevant knowledge for a wide variety of national, regional and international bodies. The aim of this investigation is to develop an understanding of the effectiveness of the Regular Process during its first cycle, by adapting evaluation methodologies from other GEA reviews.

MATERIALS AND METHODS

Information Collection

The investigation, conducted in 2018, included survey responses from 96 individuals spanning 35 different countries as well as a series of 17 semi-structured interviews with ocean and sustainability experts who spanned 10 different countries. The survey was designed to investigate how potential users of the FWOA have interacted with the assessment and perceived its development, while expert interviews were aimed at investigating the operation and structure of the Regular Process. Further document mining was performed to support and confirm

interviewee and survey feedback, while also contributing to investigation of Regular Process operations.

Survey Dissemination

Survey dissemination occurred according to a mixture of snowball and judgment-based distribution methodologies, which utilized the online platforms, partnerships, contacts and national focal points of organizations such as Future Earth Coasts and the Regional Seas Programmes. Dissemination involved numerous web and social media postings as well as approximately 2500 emails. The survey was made available in both Google Forms and LimeSurvey. Google Forms was chosen due to its user-friendliness and simple development interface. LimeSurvey was chosen as a secondary platform to increase the accessibility of the survey beyond the limits of G suite products. A total of 102 responses were collected, 96 of which were useable.

Data Analysis

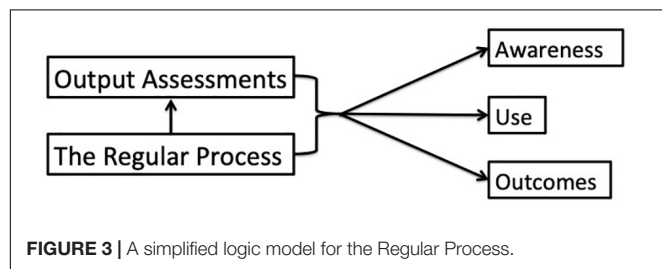
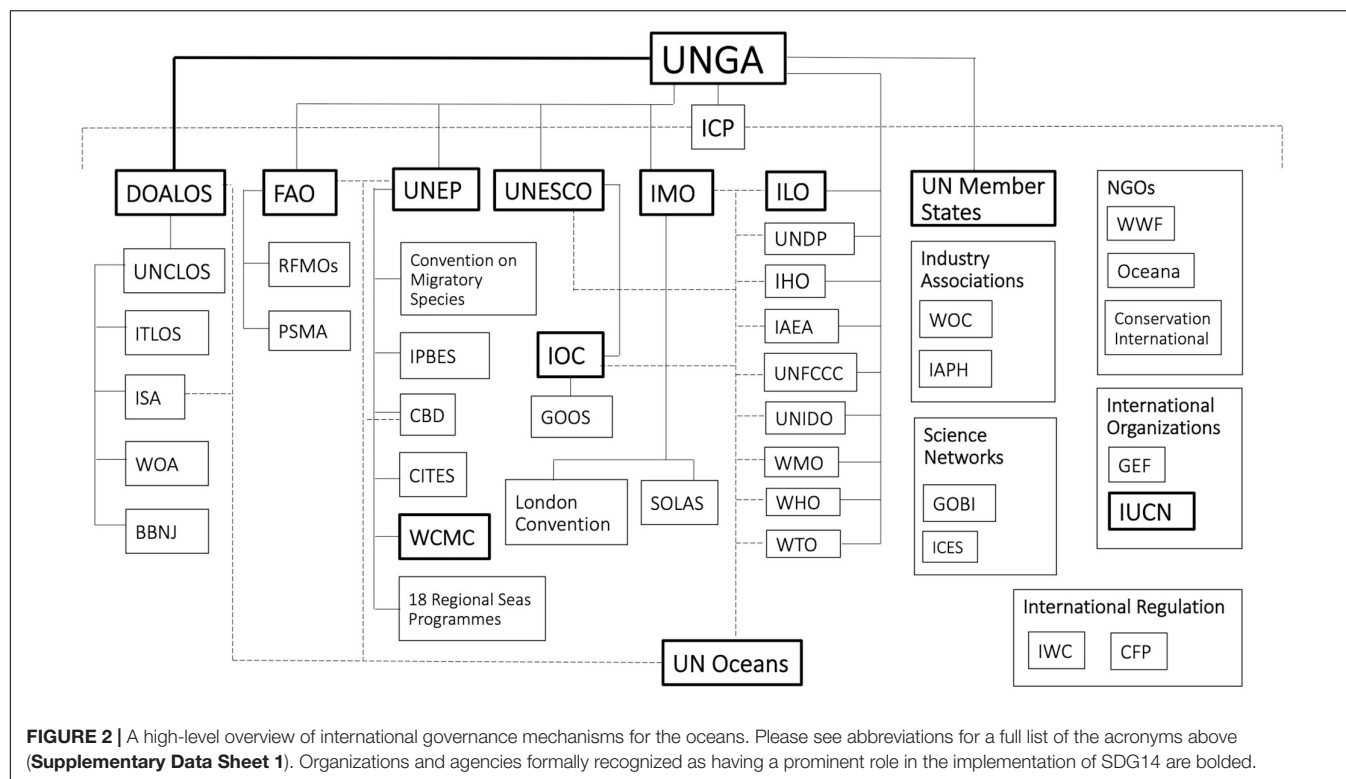
The survey output from both Google Forms and Limesurvey was transferred into excel and integrated. Further data munging was completed in excel before data analysis. Quantitative data was statistically and numerically analyzed in R, while qualitative data was analyzed directly in excel.

GEA Evaluation Methodology

Standard GEA evaluation methodologies are not particularly consistent across the literature (Clark et al., 2002, 2006; Alcamo, 2017; Rioussset et al., 2017). However, much of the literature focuses on the critical importance of the assessment compilation process in determining overall assessment effectiveness and influence (Mitchell et al., 2006). Similarly, many evaluations involve the use of performance metrics, predominantly credibility, legitimacy and salience to determine audience perceptions of the assessment (Cash and Clark, 2001; Clark et al., 2002; Mitchell et al., 2006; Rothman et al., 2009; Alcamo, 2017). Alcamo (2017) has also recently introduced the idea of utilizing logic models² to frame GEA outcomes and outputs (Alcamo, 2017). Other experts have emphasized the need for a combination of evaluation methodologies (Fazey et al., 2014). Here, we evaluate FWOA influence with a three pronged approach, involving a logic model of evidenced and perceived FWOA outputs and outcomes, audience perceptions of FWOA credibility, legitimacy and salience and feedback on the effectiveness of operations within the first cycle of the Regular Process.

The logic model categorized survey respondent and interviewee perceptions of influence into three types; awareness of the assessment, assessment use and assessment outcomes (Figure 3). Here, awareness refers to the extent of knowledge that the FWOA exists, utilization refers to evidence of the FWOA's application and outcomes refer to changes affected by the FWOA. This may range from changes in discourse, issue prioritization, behavior, institutional structure, policy, capacity

²A logic model is a visual diagram of a process or system that illustrates connections between aspects of the process or system and their impact (Anderson et al., 2011; Alcamo, 2017).



building or the natural environment. Here, FWOA outcomes were assessed by analyzing survey and interviewee feedback on three criteria; how well the FWOA contributed toward capacity building, how well it influenced policy development and how well it addressed its objective.

RESULTS

Demographics

The survey generated responses from 96 individuals across the globe from organizations spanning 35 different countries. Canada, the United States, France, and the United Kingdom hosted the most respondent organizations respectively (Figure 4). The majority of survey responses came from individuals in either an academic and research or governmental institution, including universities, marine research centers, sustainable development think tanks, national government ministries, regional organizations, UN agencies and permanent

missions to the UN. There were a small minority of survey respondents from NGOs and industry as well.

Interviews were conducted with 17 ocean and sustainability experts, including seven participants in the Regular Process.³ In summary, seven of the interviewees were from strictly academic or research institutions, five were from government institutions and two had recent experience in both governmental and academic institutions. There were also two interviewees from NGOs and one from the private sector.

Awareness of the FWOA

Approximately 52% of survey respondents indicated that they were aware of the FWOA. Of those respondents who indicated that they were aware of the assessment, over half indicated they had used it in some way and over 20% indicated that they were contributors to it. From the 17 interviewees, 13 expressed a high degree of familiarity with the FWOA, four were aware that the assessment took place but immediately expressed reservations based on their lack of familiarity with the publication.

Evidence of FWOA Use

Results of FWOA use by survey respondents showed that the assessment has primarily been used for purposes of coastal and marine research, policy development and awareness raising activities (Figure 5).

³A participant of the Regular Process may include members of the Group of Experts, members of the Pool of Experts, technical and scientific support from involved UN agencies, National Focal Points, UN agency contact points, members of the DOALOS secretariat, or the bureau of the *Ad Hoc* Working Group of the Whole.

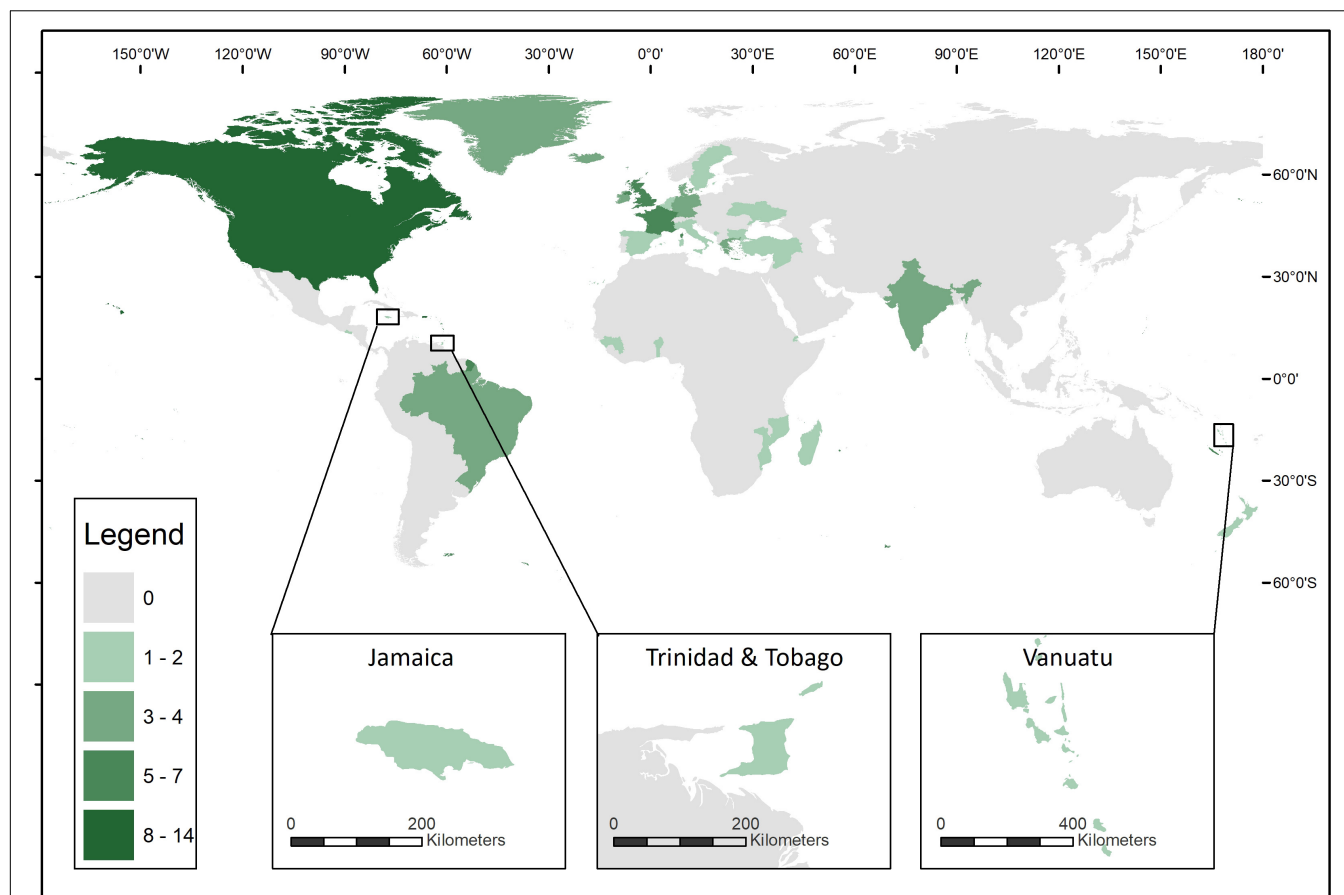


FIGURE 4 | The geographic representation of survey respondents. It should be noted that the majority of survey responses came from individuals based at organizations in the UNGA's Western European and others regional group.

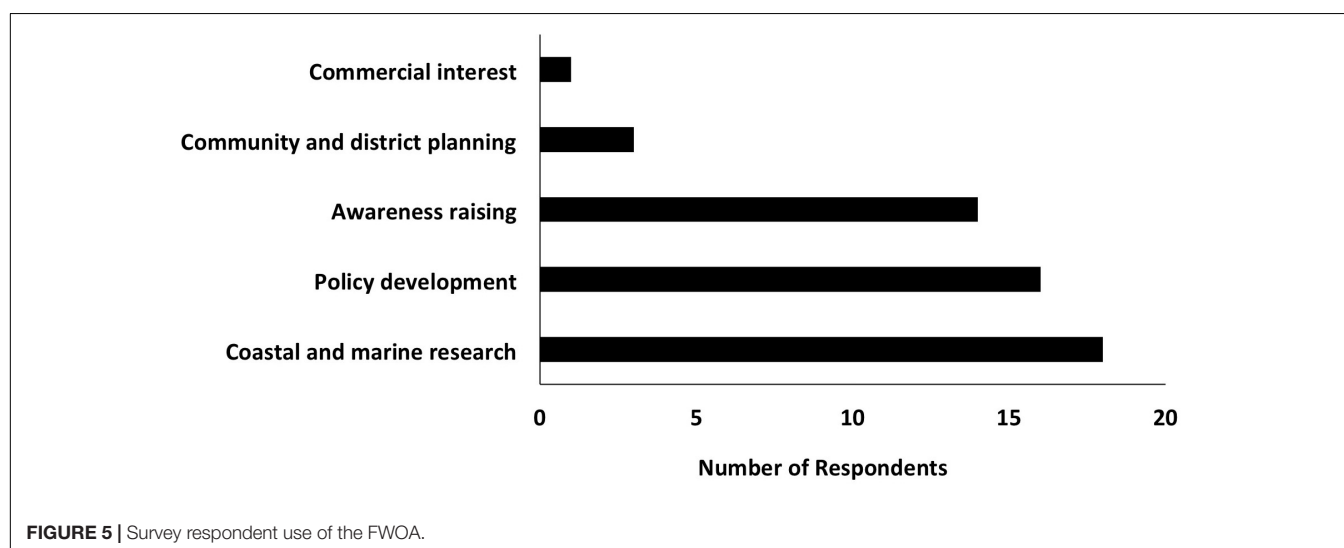


FIGURE 5 | Survey respondent use of the FWOA.

Survey respondents did not elaborate on their use of the FWOA, however, some evidence of its use arose through the interviews. For example, a small number of interviewees indicated that they had used the FWOA for academic or research

purposes and an equal number indicated that they had used the FWOA for awareness raising. “I would use information from the world ocean assessment in my presentation.” None of the interviewees reported using the FWOA directly themselves

for policy development, however, one interviewee described observing the assessment being used in a policy development context (see outcomes section below).

Outcomes of Application

The outcomes of the FWOA were categorized into three thematic areas; capacity building, policy development and the fulfillment of the FWOA objective. Both survey respondents and interviewees shared perspectives on capacity building and policy development, however, reference to the FWOA objective and perceptions about it were left out of the scope of the survey.

Capacity Building

The vast majority of interviewees questioned on the topic of capacity building expressed extreme uncertainty about this type of influence. Despite these initial responses, there were instances where both survey respondents and interviewees shared examples of how the FWOA contributed to capacity building efforts. For instance, a small number of survey respondents and interviewees commented on the FWOA's application in prioritizing research and teaching material. One interviewee went on to describe how *"some universities have actually come up with training programs based on that information compiled together"* in the FWOA.

A handful of interviewees and survey respondents also highlighted the FWOA's role in building institutional capacity at both a regional and international level. For instance, one interviewee suggested that the workshops in the first cycle of the Regular Process had facilitated the bridging of different networks and academic silos at a regional level: *"We now have connections in the Caribbean to experts working in socio-economic areas that we never had before. There were relationships forged at the workshop that continue in projects now, that I can see very clearly and I'm just assuming that that would have occurred in many of the other workshops as well."* Another example indicated that the FWOA had motivated UNESCO's Ocean Biogeographic Information System (OBIS) to place greater consideration on environmental factors during its data compilation and provisioning exercises.

Policy Influence

In general survey respondents and interviewees seemed to have difficulty connecting the FWOA to specific policy developments: *"I'm not aware of anything that's directly a product of it."* This was particularly surprising given that 16 of the survey respondents had previously indicated that they had used the FWOA document for policy development (Figure 4). Further, when survey respondents were questioned on the most dominant policy influences for ocean sustainability, the FWOA was majorly overshadowed by other conventions and programs like UNCLOS, the Regional Seas Programmes, the Sustainable Development Goals, various fishing policies/agreements and IMO directives (Figure 6).

This view seemed to be supported by some interviewees, who indicated that the presence of other global ocean assessments like the Ocean Health Index (OHI) and the Intergovernmental Panel on Climate Change (IPCC) were perhaps more widespread within international environmental discourse than the FWOA.

However, one point of substantial discussion amongst the interviewees concerned the FWOA's presence in political discourse and awareness of it in political circles. The FWOA was observed to have featured in political discourse at the UNGA, in some of the Regional Seas Programmes, and at G7 and G20 meetings, with a suggestion that the FWOA had even helped to motivate policy developments on marine plastics in those two fora. *"You have the G7 and G20 with the decisions on plastic, which was something unbelievable. . . We never thought that was going to happen."*

The FWOA's prominence in the ongoing UNGA negotiations for an International Legally Binding Instrument (ILBI) to sustainably manage and protect Biodiversity Beyond National Jurisdiction (BBNJ), was also flagged. It was suggested that the FWOA contributed to giving the BBNJ Preparatory Committee its mandate to begin planning the negotiations:

"It lead to closure on what needed to be negotiated and trigger giving the prep com its charge and having the prep com have enough information to write a clear negotiating mandate for this new instrument. Both of those things did happen, I don't think either one could have happened without the world ocean assessment. It certainly doesn't mean the world ocean assessment alone had those consequences but without the world ocean assessment, the type of discussions that lead to those two things would have had no basis."

Despite these positive examples, a common perception of a lack of awareness about the FWOA amongst officials both within national governments and outside of the UN system, prevailed. This is captured well by the following statement:

"I still come across, have debates, discussions with the people I call influencers, they might be ministers or secretaries in ministries of environment or they might be technocrats in the ministries that deal with oceans, but if I ask, and they saying okay we're doing things differently, and I say have you seen or read the world ocean assessment? They ask me what is that?"

The FWOA and Its Objective

Broadly, the UNGA charges the Regular Process to monitor the condition of the oceans globally to supranationally with an aim to inform decision-making and support efforts to sustainably manage the oceans in line with international law. The scope of the first cycle of Regular Process was to set a baseline (United Nations, 2016).

Interviewee perspectives on how well the FWOA achieved its objective were mixed. Most expressed that they either felt the FWOA had partially achieved its objective or that they were uncertain as to the progress toward its objective. Yet a small number expressed that they felt the objective had been fully achieved. Despite these different perspectives, similar lines of evidence were used to justify their views. For instance, a small number of interviewees emphasized the large volume of scientific output in the FWOA. As one FWOA contributor suggested, *"there's a huge amount of information there, and from very, very good sources in some cases."* However, there were roughly an equal number of interviewees who questioned its usability, impact and popularity when discussing its achievement. For instance, one interviewee suggested that *"it hasn't permeated into the ocean*



FIGURE 6 | A word cloud depicting the relative number of references to international ocean policy influences mentioned by survey respondents. The size of each policy influencer in the cloud is proportional to the number of times that political influencer was mentioned by survey respondents (Powered by WordArt.com).

community that much.” This view was also shared by an FWOA contributor: “*did it have all of the impact that those of us involved in it hoped it did? No*”.

Attributes of Assessment Influence

Since the FWOA took place under the highest political body in the world; the UNGA, legitimacy was not addressed in the survey and only briefly covered in the interviews. Initial interviewee feedback seemed to support prior assumptions that the FWOA attained a high level of legitimacy from its origins “*under the auspices of the UN system*.” Yet, a small number suggested that legitimacy could still be improved by widening participation and in particular the diversity of experts.

Survey Respondents who had used the FWOA perceived its credibility more positively than respondents who were simply aware of it, but this difference in perspective was not statistically significant (Table 1). For interviewees, there was a general feeling that the FWOA maintained a high level of scientific credibility: “*I think from a scientific point of view there is probably very high credibility*.” Most interviewees pointed to the scientific reputation of members of the Group and Pool of experts as a sign that credibility had been upheld.

The relevancy of the FWOA was viewed more positively by survey respondents who had used it than by respondents who were simply aware of it (Table 1). This discrepancy was consistent for all three indicators of relevancy (Table 1). In general, interviewees were highly critical of the FWOA’s topical structure, its geographic coverage, its disciplinary diversity, the manner in which it was promoted and the communication style it adopted. The later was particularly well stated by one interviewee: “*If we talk about you know this is supposed to help decision making*

TABLE 1 | The mean credibility and salience scores provided by survey respondents.

Perceptions of Credibility	Aware	User	Wilcoxon (p-value)	Kruskal-Wallis (p-value)
Scientific Robustness	3.32	3.69	0.17	0.16
Perceptions of Salience				
Relevance of Topics	3.11	4.08	0.0015	0.0014
Relevance of Scale	3	3.73	0.013	0.013
Relevance of Scope	2.94	3.89	0.0013	0.0013

Scores are based on individual rankings from 1 to 5 with 1 being low credibility or salience and 5 being high credibility or salience. Statistical assessment of the mean difference in score between aware and user groups was conducted using the Wilcoxon test and verified with the Kruskal-Wallis test.

or help inform decision makers then you have to cater for those audiences, and are we doing that effectively? I think I would just put a question mark there. . . if I don’t provide you with something that you’d be comfortable to read or have the time to read, then there is no point really.”

Participation: A Cross Cutting Issue

Nearly every interviewee expressed some type of concern about participation within the first cycle of the Regular Process. First, concerns were raised over the diversity of expertise within the *Ad Hoc* Working Group of the Whole, its Bureau and the secretariat. While meetings of the *Ad Hoc* Working Group of the Whole attracted the participation of legal and political experts from permanent missions to the UN, members of the Bureau and staff of the secretariat, official meeting records and interview feedback suggests that scientific expertise amongst these managerial and oversight bodies was low (United Nations General Assembly [UNGA], 2011, 2013a, 2014, 2015a). As one

interviewee suggested “*there were some countries that were interested enough in the World Ocean Assessment and what it had to offer that they would bring ocean experts to Ad Hoc Working Group meetings so that they could be appropriately advised, but those were in the minority. There were very few of those.*” Second, interviewees and documents revealed that participation from many national government ministries and indigenous knowledge groups at Ad Hoc Working Group of the Whole meetings was non-existent. A proposal for the development of national focal points for the Regular Process was rejected by the UNGA. While many intergovernmental organizations were present at Ad Hoc Working Group of the Whole meetings, their involvement was said to be limited. While workshops were identified as useful grounds for capacity building and may have involved participation from the aforementioned groups, these sessions didn’t seem to influence the scope of the FWOA. Third, interviewees voiced concerns over the disciplinary diversity within the Group of Experts and Pool of Experts. Finally, there was a sense that there had been an inequality in the amount of participation from members of the group and pool of experts, particularly with regards to the developing-developed nation divide: “*I think it would be naive to assume that all of the members of the Group of Experts actively participated in it and in the opinions expressed and the knowledge that was gathered.*”

The Regular Process

Many of the interviewees were quite eager to share their perspectives on the operation of the Regular Process. From this feedback, it seems that the first cycle of the Regular Process was successful at generating discussion and interaction between the politically minded Ad Hoc Working Group of the Whole and the scientifically minded Group of Experts in an attempt to co-produce knowledge across the science-policy interface. However, interviewees suggested that process operations suffered from two aspects; a lack of financial support and heavy top-down political control.

Interviewees suggested that the lack of financial support hampered the coordination between authors, constrained involvement from developing-nation experts, reduced the diversity of disciplinary expertise, restricted assessment scope, reduced the communicability of the assessment, limited awareness of the final product and put the long term sustainability of the process at risk. As one interviewee suggested “*people from developing countries being able to participate in [the] meetings was subject to funding and the funding was not there.*” While members of the Group of Experts from developing nations had some travel costs covered, there was no financial compensation for their efforts in the Regular Process, and absolutely no funds provided for either travel or work for members of the Pool of Experts. Other interviewees made the point that the final “*report is just in English. Yet the world you know speaks so many languages.*” In general, these comments indicate that the conservative resource provision⁴ motivated

a departure from many of the recommended principles and emphasized considerations laid forth in the 2009 Assessment of Assessments (United Nations General Assembly [UNGA], 2009) and instead subjected the process to somewhat “*ad hoc*” and unorthodox operations. As one interviewee explained, those involved in the Regular Process were “*always begging and pleading*” for financial support for “*the very next meeting.*”

Most of the interviewees involved in the Regular Process also highlighted the heavy top-down political control exerted by the Ad Hoc Working Group of the Whole. Interviewees suggested that for most of the first cycle “*it was the member states who were deciding what should and should not be done.*” While their constraining oversight on the scope of the FWOA was particularly notable, interviewees suggested they dictated assessment layout and the communication style as well: “*They wanted a factual encyclopedia to work from full stop. And that explains a lot of why the First World Ocean Assessment reads the way it does with so little integration across chapters or interpretation within chapters of the policy implications of the trends. Because those were not accidentally overlooked but very explicitly made out of the scope.*” Additionally, it is worth noting that the summary of the FWOA had to be presented to the UNGA as an Assembly document, which further restricted its style and eliminated any potential opportunity for including graphics.

Interviewees familiar with the inner workings of the FWOA suggested that this strict political oversight and some of the funding challenges were a result of political anxieties between member states: “*There was a general feeling that the Regular Process could become something that would be exploited for some purpose.*” Issues ranging from maritime territorial disputes to economic concerns to the BBNJ negotiations seemed to fuel intense discourse over the structure of power within the Regular Process. Mistrust was widespread at times, and a particular rift seemed to form between developing and developed nations over their divergent interests in the Regular Process. To abate this contestation, it seems that the Regular Process was organized to avoid extensive influence from individual contributors, national government ministries, regional organizations, NGOs and other UN agencies and organizations. This meant that, despite the participation of the aforementioned groups, it was “*only the states whose consensus really [mattered]*” when considering the FWOA’s design. It seems this managerial operation also inadvertently disincentivized funding for the FWOA by either politicizing the funding arrangement or by creating a sense of uncertainty around the political and scientific direction of FWOA development.

DISCUSSION

In general, results from the survey and interviews suggest that awareness and use of the FWOA amongst the ocean and

post-assessment estimates from those involved in the first cycle of the Regular Process suggest that the voluntary trust fund, from which most of the FWOA was compiled, totaled approximately \$300 000USD. A substantial part of this was the result of fundraising by members of the Group of Experts. This fund was predominantly used to support travel costs for developing nation experts to attend Ad Hoc Working Group meetings as well as support a Special Scholarship Fund for training programs in developing nations.

⁴Prior funding estimates for the FWOA ranged from 20–28 million USD (United Nations General Assembly [UNGA], 2009; Global Marine Assessment International Workshop, 2004). While no official budget was ever compiled,

sustainability community was moderate. There was isolated evidence of the FWOA's influence on the production of teaching material, networking, regional assessment capacity building and policy discourse. However direct outcomes of the FWOA were challenging to identify. Since historically influential GEAs have generally had a strong connection to policy development (Mitchell et al., 2006; Jabbour and Flachslund, 2017), the lack of notable policy change resulting from the FWOA is concerning. While policy influence may develop over time (Mitchell et al., 2006), the institutional discrepancy in awareness and discussion about the FWOA could perhaps limit its future political uptake, as government ministries remain less informed than organizations within the UN system. Taken together, these results suggest that use of the FWOA was perhaps superficial and raises the question as to whether the FWOA produced enough actionable outcomes to fully achieve its expected contribution to sustainable ocean management activities. These perspectives also seem to provide initial support for the common perception that the FWOA lacked relevance to the needs of the international ocean sustainability community (Alcamo, 2017). Additionally, it raises questions as to how the Regular Process operates and interacts with existing ocean governance and sustainability minded institutions, how the Regular Process generated influence at regional, national and local scales and how the Regular Process will generate long-term influence on society and the state of the marine environment (Alcamo, 2017).

Despite the participation concerns voiced by interviewees, overall perceptions of FWOA legitimacy and credibility seemed quite positive. It is likely that formal UN political structures including those to govern peer review of the FWOA, select accredited experts and involve relevant IGO's, NGO's and regional organizations, upheld the legitimacy and credibility of the FWOA to the wider ocean sustainability community (Mitchell et al., 2006; Mauser et al., 2013). While the survey results revealed a discrepancy in the perception of FWOA credibility between users and those simply aware of the FWOA, this discrepancy was not statistically significant and was smaller than the discrepancy between these same groups' perceptions of FWOA salience (Table 1). The relative variability in perceptions of salience coupled with the fact that FWOA legitimacy was rarely questioned during the interviews, suggests that perceptions of salience amongst some factions of the ocean and sustainability community were a particularly prominent limitation for the FWOA's application and thus its societal influence. This seemed to be supported by the extensive criticisms of FWOA salience. It is likely that these perceptions of salience were fueled by participation and coordinative challenges that emerged as a result of the resource availability and political environment during the first cycle of the Regular Process.

Issues of participation were the most prominent and included the structure of the science policy-interface, institutional involvement, disciplinary diversity and North-South contributory consistency. First, it seems that the power dynamics across the science-policy interface heavily favored the political considerations of the *Ad Hoc* Working Group

of the Whole. Simultaneously, communication pathways and participatory structures were not able to effectively facilitate the flow of scientific expertise to those responsible for crafting the scope of the FWOA. Collectively, the result was that "*this technical assessment [was] managed by a political process*" with personnel who were "*not particularly well informed*" on socio-environmental ocean affairs or scientific assessments. While these operations would have implications for the structure and integration of the FWOA document as well as its salience to sustainable development actors, it more importantly would have restricted the potential for social learning and capacity building to occur between policy makers and scientists (Heink et al., 2015).

Second, it seems that institutional involvement in the first cycle of the Regular Process was perhaps reserved or non-existent in many cases. For national governments, formal representation predominantly came from permanent missions to the UN and not state capitals. A lack of formal connection to, and involvement from, relevant national government ministries meant that the scoping of the FWOA largely developed in isolation from these important decision-making bodies. Additionally, local and indigenous knowledge groups were generally absent from *Ad Hoc* Working Group of the Whole meetings as well as workshops (United Nations General Assembly [UNGA], 2011, 2013a,b, 2014, 2015a). Finally, the unequal power-sharing dynamics of the Regular Process meant that regional and intergovernmental organizations that did attend *Ad Hoc* Working Group of the Whole Meetings were not able to meaningfully influence the scope of the FWOA. In all three instances, it is likely that these groups' marginalization and lack of participation in decision-making activities didn't allow them to express how the FWOA related to national, regional, sectoral or cultural policy and environment contexts, which would have likely reduced the relevance of the FWOA for them.

Third, low resource availability seems to have contributed to limit the diversity and equality of participation within the Group of Experts and Pool of Experts. Without specific financial support to undertake work on the FWOA, developing nation scientists could not provide as much meaningful input as experts from developed nations, many of whom were supported by their government ministries to work on the FWOA. Disproportionate involvement from developed nation scientists could have limited the degree to which the FWOA expressed their perspectives and thus potentially undermined Regular Process efforts to build capacity in developing nations. Additionally, it seems likely that the lack of financial support could have contributed to limiting the disciplinary diversity of expertise by further disincentivizing participation from unengaged socio-economic experts. This disciplinary gap would have limited the interdisciplinary capacity and potential for integration on sustainable development topics. It seems likely that this led to the FWOA's disproportionate focus on scientific data that many of the interviewees identified.

There were also issues around the coordination and promotion of the FWOA, which were likely manifestations of low financial support for the Regular Process. The lack

of sponsored meetings for chapter writing teams meant that compilation was often performed remotely, which in turn had the potential to reduce collaboration and cross-disciplinary learning amongst members of the Group of Experts and Pool of Experts. It seems likely this had ramifications for the FWOA's perceived credibility, salience and ultimately user-friendliness. Additionally, funding limitations constrained opportunities to further promote the FWOA and offer communication of the final document in different written languages.⁵ This severely restricted the FWOA's potential audience and thus its uptake for a large percentage of the world.

Finally, it is worth noting the timeline of FWOA development in relation to international sustainable development discourse. International political discussions regarding the establishment of a Regular Process date back to 1999, with process development occurring over the following 11–12 years (United Nations General Assembly [UNGA], 2003b; United Nations, 2016). During this time, the international sustainable development community was still focused on the Millennium Development Goals, which were perhaps less environmentally oriented (Sachs, 2012; Kumar et al., 2016). Even when the FWOA was released in 2015, the Sustainable Development Goals, were just getting published. Thus, it seems quite likely that this disjuncture in the development timelines of the Regular Process and the SDGs harmed the relevance of the FWOA for sustainable development activities.

In summary, it seems that the politically controlled process and scientifically compiled FWOA were successful in establishing a politically accepted set of credible ocean facts. The UNGA has approved the summary document (United Nations General Assembly [UNGA], 2015c) and the full FWOA is likely useful for political and legal experts to negotiate marine affairs issues at the international level. While aspects of the FWOA's development may be consistent with the expectations of a GEA produced in the early stages of an issue domain (Mitchell et al., 2006), the degree to which this style of assessment can influence sustainable development is questionable. It seems unlikely that future cycles of the Regular Process will be able to meaningfully support efforts toward SDG14 if they continue to rely on politically constrained knowledge production and the output of knowledge products that lack thematic integration, rely on a narrow range of knowledge types and are specifically tailored for high-level international policy makers (Mitchell et al., 2006; Sala et al., 2015; Herrero et al., 2018; Miller and Wyborn, 2018). Changes to assessment style can only result from process adjustments. The FAO, IMO, UNEP, IOC/UNESCO are all considered partner or custodian agencies for SDG14 and national governments are considered the primary implementing bodies for the 2015 sustainable development agenda (United Nations General Assembly [UNGA], 2015b). Neglecting to involve these organizations and governments within negotiations over the scope of future World Ocean Assessments will limit their relevance to them and thus the Regular Process' accessibility

to many of the primary decision-making arenas concerned with the sustainable development of the marine environment (Moser, 2016).

While co-designing and co-producing knowledge aims to increase participation and equalize power dynamics, these are not feats that occur over short timelines. It takes a huge amount of resource investment and time (Mitchell et al., 2006; Flinders et al., 2016). van Kerkhoff and Lebel (2015) suggest that co-production and co-design are “grown” and developed as opposed to “implemented.” Thus actors in the process must build trust between each other and understand the limitations of their expertise and how to delegate and share responsibilities accordingly (Mausser et al., 2013; Binder et al., 2015; van Kerkhoff and Lebel, 2015; Clark et al., 2016). They must also bridge their differences in perspective so that they can learn from each other to build their capacity for informed decision making in the future (Clark et al., 2016; Parsons et al., 2016). Considering the scope and challenging political circumstances within which the FWOA arose, engaging an external boundary organization⁶ as a neutral facilitator may be advantageous in future cycles (Weichselgartner and Kasperson, 2010; Herrero et al., 2018). This organization could provide knowledge brokering, capacity building and consultative services to improve connections with external expert networks, as well as advise upon and facilitate communication across the science-policy interface, geographic scales and knowledge types (Michaels, 2009; Ward et al., 2009; Cvitanovic et al., 2015). Additionally, they could help to develop a safe environment for social learning and advise on how to bolster assessment salience while simultaneously upholding process legitimacy and credibility (Michaels, 2009; Ward et al., 2009; Guido et al., 2016).

While the configuration of a GEA process is highly context specific (Mitchell et al., 2006; Beck et al., 2014), due to their size, scope and association with the UN system, the IPCC and IPBES may have particular relevance to the Regular Process and therefore face similar challenges. These organizations have adapted in different ways to address opportunities relating to participation, knowledge integration and the structure of the science-policy interface. For instance, both the IPCC and IPBES have developed and maintained strong connections to policy prescriptive bodies, most notably the United Nations Framework Convention on Climate Change (UNFCCC) for the IPCC and the Convention on Biological Diversity (CBD) for IPBES (Brooks et al., 2014; Fløttum et al., 2016). Additionally, both the IPCC and IPBES have defined plenary bodies composed of national focal points, which provides them with direct correspondence to relevant national ministries. The IPCC in particular is notable for its strong engagement with state representatives during the development and review of assessment summaries for policy makers (Leemans, 2008; Fløttum et al., 2016). IPBES on the other hand, has made concerted efforts to include and value a multitude of knowledge types in its assessments. For

⁵It should be noted that the FWOA summary document was provided in all 6 UN languages but the full FWOA document was only provided in English.

⁶A boundary organization is a body that operates within the science-policy interface to address challenges (Guston, 2001). They may function by developing, facilitating and supporting opportunities for exchanging specific considerations, viewpoints and information (Guido et al., 2016). A boundary organization is accountable to both science and policy factions (Guston, 2001).

instance, it has established a task force to support indigenous peoples participation in the assessment process as well as diversified its biodiversity valuation techniques beyond those of simple economic focus (Beck et al., 2014; Tengö et al., 2017). These assessment features may stand as inspiration for the Regular Process in future iterations. However, the context dependence of their success means that the Regular Process will need to adapt its own implementation strategies, which are specific to the historical context of the international marine governance domain.

Process structures for the Second World Ocean Assessment (SWOA) show some signs of improvement with increased activity from the bureau of the *Ad Hoc* Working Group of the Whole, development of national focal points and increasing workshop involvement from relevant IGOs (United Nations General Assembly [UNGA], 2018). Additionally, the document style is to be refined and will feature a new structure following internal feedback on the contents of the first WOA report. However, these changes still seem superficial to generate the necessary uptake for the SWOA to effectively contribute to SDG14, as concerns over the disciplinary diversity of members in the Group of Experts and Pool of Experts (Simcock and Ruwa, 2019) and disproportionate power sharing and participation still persist. Building trust between the actors engaged in the regular process will be a central challenge to growing an environment suitable for knowledge co-production (Clark et al., 2016).

Here, we outline the following five recommendations to improve operations in the Regular Process and the influence of future cycles:

- (1) Foster communication across the science-policy interface to build trust between scientists and policy makers.
- (2) Develop a space that better facilitates capacity building across the science-policy interface, where scientists are educated on the political ramifications of their work and policy makers are educated on the environmental priorities and trends.
- (3) Increase participation to reflect the target audience required to support the overarching aim of the Regular Process.
 - (a) Increase engagement and empower organizations and groups across scales (regional and national), sectoral boundaries (civil society and industry) and knowledge types (socio-economic and indigenous knowledge).
 - (b) Need a particular focus on increasing interdisciplinary and intercultural diversity of members within the Group of Experts.
- (4) Engage with external boundary organizations to facilitate the generation of co-produced knowledge that is credible, legitimate as well as salient.
- (5) Dramatically increase funding to match the intended scope and expectations of future cycles.
- (6) Encourage the integration of information from different knowledge types as well as the connectivity between themes within future assessments in order to support relevance to sustainable development applications.
- (7) Need top down, mandated GEAs that are better connected with stakeholders, as per above recommendations, plus more investment in bottom up approaches to partnership building, that can bring about the changes needed to achieve sustainable development of the ocean.
- (8) Consider aspects of best practice from other GEAs, where relevant or appropriate, given the specific context of the Regular Process.

CONCLUSION

The FWOA emerged in a challenging environment, impacted by funding woes and top-down constraint as a result of political anxieties. This substantially impacted the participation arrangement and operations within the Regular Process and ultimately the FWOA's salience to the sustainable development community. As a result, the FWOA wasn't able to generate the outcomes that had originally been expected of it, despite general acceptance of its findings. Future iterations of the Regular Process will need to build trust between actors, widen participation to a great range of sustainable development actors and above all, member states, the UN system and the wider ocean development community will need to provide funding. With rapid change to global marine environments ongoing, there is an urgent need to cultivate a transdisciplinary-learning environment where co-design, co-production and ultimately the salience of future World Ocean Assessments can flourish.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

KF and VC developed the research design and methodology, and wrote the manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fmars.2019.00612/full#supplementary-material>

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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