Ten Considerations for Research Funders Seeking to Enhance Knowledge Exchange and the Impact of Marine Science on Policy and Practice

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Research funders can play an important role in supporting the integration of marine science into policy and practice to enable evidence-informed decision-making. However, to date, there is a paucity of guidance available to help research funders understand the specific actions they can take to support knowledge exchange among the researchers that they fund and relevant stakeholders, particularly within marine contexts. This Brief Research Report aims to begin to fill this gap through an in-depth case study of the Lenfest Ocean Program (LOP). Specifically, through qualitative interviews with 32 participants across eight LOP funded research projects (i.e., case studies) we sought to: (i) understand the types of impacts that have resulted from the LOP funded research, (ii) determine which activities undertaken by the LOP enabled funded research projects to achieve these impacts, and (iii) synthesize findings to articulate the core lessons that have emerged from our examination of these research projects. Results show that the concept of "research impact" is complex and can be interpreted in a number of ways including: (i) raising awareness of research among end-users, (ii) development and expansion of social networks, (iii) the provision of information to decision-makers, (iv) the development of decision-support tools, and (v) a direct contribution to policy change. We highlight the ways by which the LOP has supported the attainment of these impacts, as well as 10 general considerations that research funders should consider when seeking to enhance the impact of the research that they fund on marine policy and practice.

Keywords: knowledge exchange, research impact, research funders, science-policy, marine management

INTRODUCTION

Successfully managing coastal and marine ecosystems into the future requires the integration of marine science into policy and practice to enable evidence-informed decision-making (de Jonge and Giebels, 2015). Whilst some progress has been made in this regard (e.g., Cvitanovic and Hobday, 2018), significant barriers prevent the routine integration of science into decision-making processes (e.g., Cvitanovic et al., 2014; Nguyen et al., 2019). Overcoming these barriers requires wide-scale and transformative institutional changes by research organizations, decision-making agencies and research funders alike, to build improved capacity for knowledge exchange at the interface of marine science and policy, and the attainment of research impact (reviewed by Cvitanovic et al., 2015a). That is, "the positive and demonstrable benefits that can be attributed to scientific research" for societal well-being and prosperity (following Reed et al., 2018, 2020).

As a result, there has been an increased focus on understanding and identifying the institutional changes that can support a more dynamic and effective relationship between marine science, policy, and practice (e.g., Bednarek et al., 2015; Jarvis et al., 2015; Cvitanovic et al., 2018). For the most part this literature has focused on understanding the ways in which research organizations and decision-making agencies can adapt to build capacity for evidence-informed decision-making. This has led to the identification and implementation of new institutional approaches and strategies for improving knowledge exchange at the interface of marine science and policy, such as the use of knowledge brokers (Cvitanovic et al., 2017), boundary organizations (Cvitanovic et al., 2018) and the mainstreaming of participatory research approaches such as those embodied by the concept of knowledge co-production (Norström et al., 2020).

In comparison, there is a paucity of information about how research funders (also commonly referred to as research donors and grant-makers) can adapt to support improved knowledge exchange at the interface of marine science and policy to enhance research impact. Indeed, evidence from the health and medical sectors suggests that research funders have a key role to play in supporting the translation of evidence into practice (Holmes et al., 2012). In terms of environmental management, this is supported by a recent study conducted by Arnott et al. (2020) who similarly showed that changes to the structure of research funding can shape scientific practices and strengthen connections between research outcomes and knowledge use by diverse stakeholders. However, to date, no empirical researched has explored how marine research funders can improve their practices to better support knowledge exchange and the translation of marine science into policy and practice.

This Brief Research Report seeks to begin to contribute to this emerging discussion via a case study of the international Lenfest Ocean Program (LOP). Operated by the US-based The Pew Charitable Trusts, the LOP funds research projects that address the needs of marine and coastal stakeholders (i.e., supporting policy-driven research) and employs boundary spanners on their team to support grantees to engage more effectively with the people most likely to use the results (i.e., enhancing capacity for knowledge exchange and uptake), before and during projects. Specifically, we study the LOP to: (i) understand the types of impacts that have resulted from the LOP funded research, (ii) determine which activities undertaken by the LOP enabled the research projects to achieve these impacts, and (iii) synthesize findings to articulate the core lessons from these research projects. In doing so, we generate a set of key considerations for research funders seeking to fund research activities that are focused on enhancing the impact that marine science can have on policy and practice. It is important, however, to note that the lessons learned through our examination of the LOP may not be suitable across all contexts, yet serve as a starting point for future research to better understand how research funders can support the attainment of research impact.

METHODS

Case Studies

To address the aims of this project we adopted a case-study approach (for a detailed description of case-study qualitative research see Starman, 2013). Specifically, following guidance provided by Flyvbjerg (2006) on the importance of ensuring maximum variation from case studies to elucidate diverse perspectives and experiences of participants, we selected eight case studies (i.e., LOP funded research projects) as the basis for data collection. Case studies were selected using a rubric (or set of criteria) developed by the research team based on their experience working in the field (authors CC, CW, EG, RK, EivP) and directly with the LOP (author AB) to ensure a diversity across the following axes:

- Geographic scope (local to global);
- Ecological scale (e.g., single species versus ecosystem);
- Timelines (i.e., some projects that were completed versus some that were still ongoing);
- Diversity (in terms of project scope, participants size, type of research and mode of boundary spanning);
- (Perceived) success in having met their specified project goals or not.

The rubric was provided to the Project Managers at the LOP who then identified 14 potential projects that met the required criteria. Of these, eight projects were selected by the research team for inclusion in this study. These eight were chosen on the basis that they had the largest diversity of participants to ensure the inclusion of diverse perspectives (following Flyvbjerg, 2006), to avoid overlap in topic and geographic areas that were present among some of the 14 projects, and where project members (i.e., the researchers and managers who took part) were most accessible to the research team (e.g., due to logistical constraints interviews had to be undertaken in English). A list of the eight projects is provided in **Table 1**, and a brief description of each is provided in **Supplementary Material I**.

Data Collection and Analysis

To assess each case study, we used qualitative semi-structured interviews. Qualitative methods were considered advantageous

TABLE 1 | Overview of the 8 case studies that formed the basis of our study.

Case study number	Lenfest project title	Years running
1	Development of diverse tools to assess marine mammal populations and bycatch	2017–2020
2	Ecosystem modeling for the Peruvian fishery	2009–2011
3	Novel high-quality mapping of Hawaii's coral reefs	2018–2020
4	Benchmarks for Ecosystem Assessment: Indicators for Practical Ecosystem-Based Fisheries Management	2018–ongoing
5	Climate change and the oceanography of the North Atlantic Right Whale population	2018–2020
6	Establishing science-based shark catch limits	2007–2008
7	Quantifying the relationship of Northern Fur Seals, Pollock and climate change in Alaska	2018–ongoing
8	Identifying high-risk fisheries for sea turtle bycatch	2013–2015

*For detailed descriptions please see **Supplementary Material I**.*

over quantitative methods for this research as they allowed us to gain in-depth understanding of the perceptions and experiences of project participants (Hay, 2010; Bryman, 2012). Further, qualitative research approaches have previously proven an effective approach for identifying key learnings from efforts aimed at improving the relationship between science, policy, and practice (e.g., Reed et al., 2014; Cvitanovic et al., 2016, Cvitanovic et al., 2021; Marshall et al., 2017; Wyborn et al., 2018).

The interviews were designed to focus on understanding the processes and practices of collaboration between scientists and management partners within the eight selected LOP projects. Thus, interview questions focused on understanding how these collaborations emerged, the goals and objectives of the collaboration, the different stages in the development and implementation of the collaborations, the role of the LOP grant making program in supporting project activities, the challenges and opportunities the project faced, and the types of outcomes they have achieved. The interview questions were informed by a previous qualitative analysis of science-policy evaluation frameworks (see Louder et al., 2021). For consistency among interviews, each was conducted following an interview guide which can be found in **Supplementary Material II**. All interviews were undertaken in accordance with Human Research Ethics approval (Australian National University Human Ethics Committee reference 2019/514).

For each project, relevant scientists (i.e., researchers funded directly by the LOP within each case study) and resource managers (i.e., those that were identified by the LOP as being relevant end-users of the funded research) were contacted via email and invited to participate. LOP directly funds external researchers through grants to support their projects, so these grantees were the first point of contact for each case study. While many people agreed to participate, several declined for reasons relating to: (i) insufficient time to participate, (ii) language barriers and (iii) their involvement in the projects was so minor that they felt they could not provide meaningful insights. In total, across the eight projects, 52 people were invited to participate in this study, and interviews were undertaken with 32 participants—22 of whom were scientists and 10 managers. All interviews were digitally recorded, professionally transcribed to ensure their accuracy, and then coded using the software NVIVO. Coding was done to identify pertinent themes within

and across interviews based on anticipated themes that have emerged from the literature on science-policy collaborative processes and also by employing aspects of Grounded Theory to allow for analysis of themes that the literature may not have previously addressed (Glaser and Strauss, 1967; Rubin and Rubin, 2005; Charmaz, 2008). In doing so, each individual interview was coded against a set of descriptors designed to identify emergent themes and to capture the key elements of these themes (e.g., following Blythe and Cvitanovic, 2020). Coded responses were then analyzed to identify the nuanced similarities and differences between interviewee's perceptions and experiences, refining our understanding.

Methodological Limitations

In interpreting our results, it is important to also consider some challenges we experienced and thus identify potential limitations of the study. For example, we were unable to ensure strong participation from managers (i.e., end-users) for each project. For four of the eight projects, no managers agreed to take part (and for two of these projects, no managers were identified by the project leads for interview, thus there was no-one to invite to participate), and in all projects, the number of scientists interviewed were either greater than, or equal to, the numbers of managers that took part. Thus, the results presented here are overwhelmingly the perspectives of scientists involved in the case studies. This, in combination with the context specificity of each project, suggests that the insights shared in this report should not be viewed as generalizable to all boundary spanning contexts, but rather as observations that we have made based on what has been learned through the case study analysis. It is also important to keep in mind that by examining primarily the perspectives of participating scientists, this analysis does not represent the diversity of participant perspectives that we initially intended and shares limited insights into how collaborative processes work and can be better supported.

RESULTS AND DISCUSSION

Types and Range of Impacts

Academics, practitioners, and research funders are increasingly seeking to understand and evaluate the impact of research. That is, "the positive and demonstrable benefits that can be

attributed to scientific research" for the benefit of society (following Reed et al., 2018, 2020). Especially in the context of complex environmental challenges, which characterize contemporary marine socio-ecological systems (Nash et al., 2017, 2020), researchers are expected not only to advance scientific knowledge, but to demonstrably contribute to solving societal, environmental, or economic problems (Lubchecno, 1998; Cvitanovic et al., 2015b). However, current conceptualizations of research impact are largely instrumental and fail to recognize the full diversity of forms that impacts can take across the spectrum of activities that encompass the "science-policy interface" (Molas-Gallart et al., 2000; Fazey et al., 2014; Reed et al., 2018; Wyborn et al., 2018). Moving beyond such definitions is critical - both to develop indicators that can monitor and evaluate research impact, as well as guide impact planning activities to maximize the value that science can have on policy and management (Reed et al., 2020).

Results of our study reinforce that "impact" is a complex concept and can be interpreted in a wide variety of ways. Five forms of impact arise from our data analysis: (i) raising awareness of research among end-users, (ii) development and expansion of social networks, (iii) provision of information to decision-makers, (iv) development of decision-support tools, and (v) an actual contribution to policy change. It is important to note that all of the impacts reported here tend to be on the "input side" of a decision-making process (i.e., knowledge into action), which is perhaps unsurprising given the overarching framing of LOP's impact agenda as "informing decisions" through promoting open dialogue with end-users, and contributing to science (**Supplementary Material I**)— and that the interview information was mostly obtained from scientists.

When considering "impact," participants from all case studies also spoke about producing, or being close to finalizing, one or more peer-reviewed publications. This, again, may be somewhat expected for a funding organization that seeks to support scientific research. However, the analysis of interview data also showed that publications alone are insufficient to support decision-making, and in and of themselves, publications do not constitute a direct impact on policy or practice. Thus, in combination, our results highlight the importance of broadening current conceptualizations of research impact beyond the typical mantra of "impacts on policy" or publications, to better reflect the full suite of impacts that can occur through research projects that can improve decision-making capacities. Our results also highlight the need to develop more nuanced indicators to monitor, measure and evidence research impact (e.g., Maag et al., 2018).

Activities Undertaken by the Lenfest Oceans Program to Support Impact Attainment

In this section we focus on "boundary spanning" activities undertaken by LOP, and the ways in which they supported the pursuit of case study goals. We define boundary spanning

as "work to enable exchange between the production and use of knowledge to support evidence-informed decision making in a specific context," while boundary spanners are the "individuals or organizations that specifically and actively facilitate this process" (following Bednarek et al., 2018). In defining boundary spanning this way, it is important to note that the term is not characterized by any single function or role, but rather, encompasses a broad suite of activities that can be performed by individuals, teams, or entire organizations (as reviewed by Posner and Cvitanovic, 2019).

Within the present study, data analysis revealed four key boundary spanning activities undertaken by LOP to support impact attainment within the case studies: (i) support for framing and designing projects; (ii) funding synthesis research; (iii) funding expert workshops, and (iv) facilitating communication and outreach. Within each of these themes, specific activities undertaken by LOP also emerged.
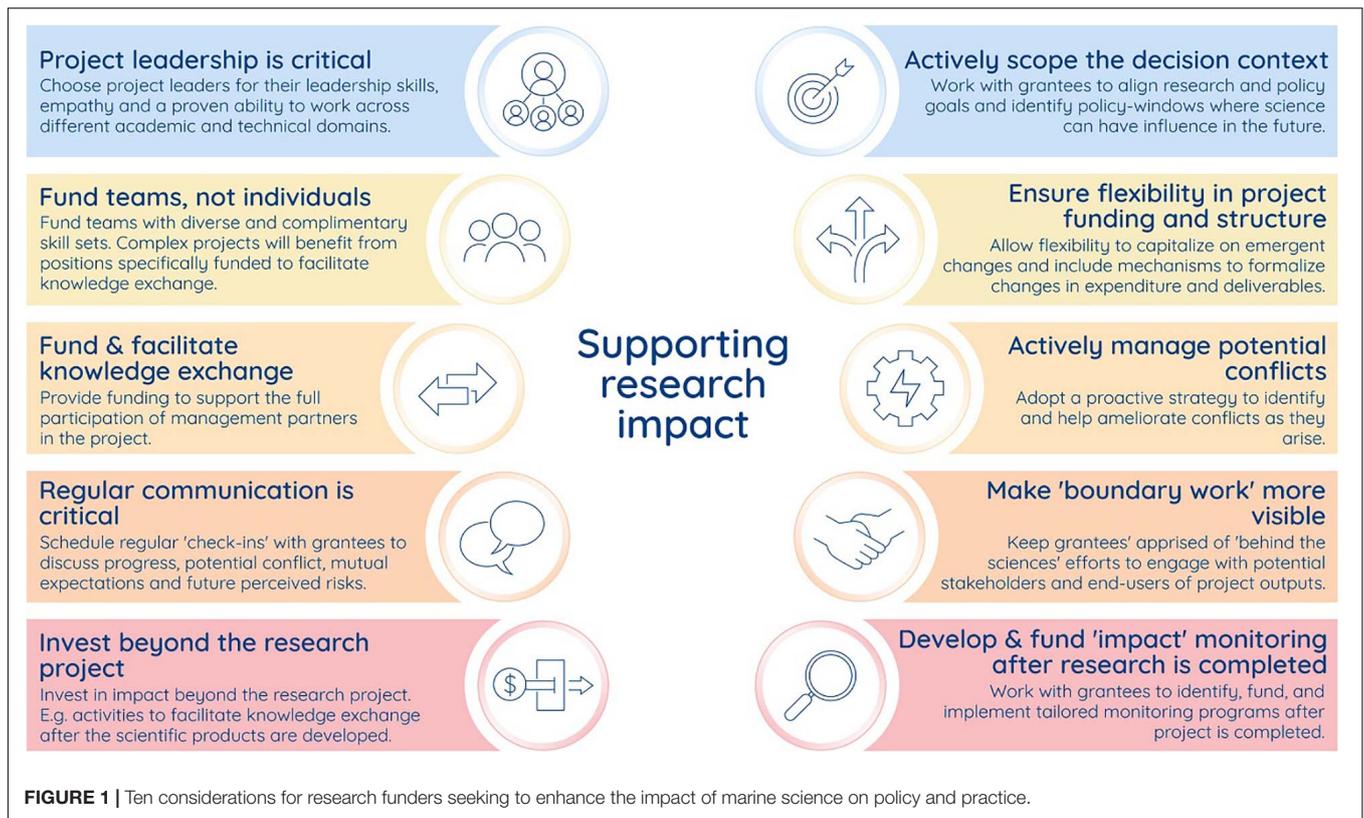
Of these activities, participants particularly appreciated the flexibility of LOPs funding model and project structure, allowing adjustments through project evolution (i.e., to respond to emergent opportunities such as engagement with a new stakeholder). For example, the Hawaii Reefs project (see project 3 in **Supplementary Material I**) provides an apt example of the value of flexible project structure, after a severe warming event occurred during the project implementation. The LOP swiftly approved a shift in direction in the project that enabled the grantees to help monitor the impacts of this event and provide additional scientific support to local decision-makers who were tasked with developing a suitable response.

"Project check-ins," logistical support, and communication/outreach support were the other most commonly mentioned activities that participants valued. For example, project check-ins were considered an important pathway for real-time knowledge exchange among grantee's and Lenfest staff, particularly in relation to forward planning of research and engagement activities, and to identify strategies to mitigate potential project challenges. Communication and outreach support was valued as it enabled grantees to share and discuss their results with relevant end-users, many of whom were unknown to the grantee. In some case studies, communication and outreach support provided by Lenfest staff help the researchers to establish a direct relationship with end-users that sustained beyond the life of the project.

Key Lessons for Research Funders

Looking across our eight case studies, 10 key lessons emerged for how research funders can better support research impact throughout the projects they fund (summarized in **Figure 1**). In this section we outline these 10 lessons, and their key components as derived through data analysis:

   1. Project leadership is critical. Choose project leaders for their leadership skills, not just their technical expertise. Desirable qualities include empathy and an ability to work

FIGURE 1 | Ten considerations for research funders seeking to enhance the impact of marine science on policy and practice.

across different academic and technical domains, to be able to communicate technical concepts to a diversity of audiences. Leaders who have existing networks with stakeholders in the relevant topic domain can enable a project to move quickly. In one project, a participant described how in their view, *'the key thing that stands out for me….ten years later….is the leadership of the project….the vision, and ability to get the right people in the room to make that happen….it would not have happened without strong leadership.'* Projects where grantees are already well connected to the decision-making context may provide opportunities to support impactful work that requires less project management engagement than other projects, as reflected by this study participants: *'This is my home state and I* [the project leader] *know everybody….[our] project has been really smooth because everybody knows everybody. Faster, cheaper, the whole thing. It's more efficient'*

2. Fund teams, not individuals. Working across science, policy, and practice is challenging, requires considerable time, and a diverse set of skills. Even the most experienced individual will struggle if they are solely responsible for leading the science *and* the engagement *and* outreach. One project participant explained *". There was so much work to be done, from lab work, to the data analysis, to the deliverables. I needed a team of people."* Thus, emphasis should be on funding teams of researchers and ensuring that teams have diverse and complimentary skill

sets. Within larger and more complex projects, consider funding a specific position, within the team, to facilitate knowledge exchange and boundary work (i.e., a knowledge broker, as described in Cvitanovic et al., 2017).

3. Fund and facilitate knowledge exchange. Consider funding key partner representatives from management organizations to support their direct engagement with researchers and enable their full participation in the project (i.e., funding for travel to attend meetings and workshops). Also consider developing projects that would encompass a stronger emphasis on knowledge exchange between scientists and managers throughout the entire life of a project, not just at the beginning (i.e., project scoping) or the end (i.e., delivery of final outputs). This could be achieved, for example, by providing funding for research partners to be "embedded" for a period of time within the relevant management agency (for a detailed overview of embedding see Roux et al., 2019). Further, throughout the process funders should organize and facilitate small meetings between project team members and relevant end-users to discuss the project, its implications, and how greater alignment between project outcomes/outputs and end-user needs can be achieved. Several interviewees spoke to the benefit of these in-person meetings, with one describing *"It is so much easier when people are in the same room. I felt like people also became more comfortable with each other. I think there will be a lot more interaction."*

4. *"Check-ins" are critical, and well regarded*. Across several case studies included in this project, one of the key lessons learned related to the importance and value of regular "check-ins" between the project team and the funders. These "check-ins" were reported as best conducted verbally (i.e., via a zoom call or face-to-face) and regularly (every 3–4 months). A participant from a project that engaged in frequent check-ins commented: *"They* [Lenfest] *give us a check-in every three months…it's useful because if we've been scattered it helps us get together and put the story together in a cohesive way."* A participant from an older project emphasized that more frequent, in-depth check-ins could have been a stronger support to the project. While the check-ins should provide an opportunity to catch-up and discuss progress to date, it is also important that they provide opportunity for discussion about next steps, expectations (i.e., where the funder could contribute, such as upcoming engagement opportunities), and to identify and brainstorm mitigation strategies for any perceived risks to the project moving forward.

5. *Invest beyond the research project*. It is well recognized that producing science alone is insufficient to facilitate its impact. Thus, efforts to invest in impact beyond the research project should be both temporal (i.e., funding beyond the life of the initial project) and programmatic (i.e., the types of activities that will be invested in). A range of opportunities to do this emerged from the analysis of our case studies including: funding a specific phase to facilitate knowledge exchange with end-users in diverse contexts after the scientific products are developed; funding to support "tool uptake" and refinement once decision-support tools have been developed; training, workshops, webinars with management to build capacity to use decision-support tools once developed; provide funding to support the participation of management partners in research, and in the immediate time after while they are learning to use project outcomes. One project participant described the need for this kind of support, saying *"If we don't have a good way to install these products in our processes, it might end up that we don't use them as well as we could. I'm not sure how It has been designed, but I hope that there are going to be workshops or videoconference, or a guideline, a manual, or someone you can call and ask again how this works. Support, a support system, something like that. That would be great."*

6. *Actively scope the decision context*. A key feature of the LOP process is the ways by which the LOP case managers work to scope the decision-making context before the project commences. This includes, for example, engaging with decision-makers or policy processes to understand when decisions are being made, what type of information or research is needed to help support informed decision-making, where there might be areas where decision-makers would benefit from a synthesis of existing or available knowledge, which organizations or researchers are working on a particular issue and how that can be leveraged to support decision-making. This scoping work is intended to identify a window where science can have influence, and is used to help grantees refine and develop their projects. The importance of this was highlighted by one interviewee who stated '*One of the things that I think really stands out about this project is that included researchers and fisheries managers right at the beginning. Integrated—and I think that's quite unique.*'

7. *Boundary spanning requires flexible funding and project structure*. Particularly for larger projects that include higher numbers of project partners or cover larger geographic areas, there is a need for project funding and structure to remain flexible and not too prescriptive. For example, our analysis of the case studies found that emergent challenges (e.g., working across cultures) or opportunities (e.g., to attend meetings with stakeholders or engage new project partners) are common, and can be managed/capitalized on through flexible funding and project structure. For example, one participant involved in a global LOP funded project noted that: '*We have asked for extra cash to do certain things….Because it's hard to see what different countries need when you start a new project*'. One interviewee spoke to this flexibility, further commenting that *"*[Lenfest] *were incredibly tolerant to consistent changes in the project structure along the way"* with other participant's explaining that this flexibility allowed them to generate different outputs than initially intended, to navigate project challenges. Thus, when developing contracts for projects it is important to allow flexibility in both funding and project structure, and ensure that clear mechanisms are in place for project staff to identify and formalize changes in planned expenditure or timeline with the funder.

8. *Actively manage potential conflicts*. Conflict is an inherent part of complex projects that involve diverse stakeholders. It can arise because of conflicting perspectives on a problem and the appropriate strategies to address it, differences in disciplinary training and perceptions of knowledge and evidence, as well as inter-personal dynamics. Our results show instances where project participants would have appreciated greater support in mediating project conflicts, as well as the benefits other projects experienced from that greater support. While regular communication is always critical to identify and ameliorate conflicts, sometimes other strategies are also necessary such as considering tensions and dynamics when selecting teams and team leaders. This requires a good understanding of the landscape of an issue and its actors, and reiterating again the importance of the work of scoping the decision-making context. Further, grant makers could provide funding for all project staff to participate in conflict resolution training during the early stages of a collaborative project to mitigate

the likelihood and extent of potential project tensions and conflict.

9. Consider making boundary work more visible. In several of the case studies, the interviewees were unaware of the boundary work and project scoping undertaken by the funders (as detailed above in 6–8, and summarized in **Figure 1**). Thus, they were also unsure how funders could help facilitate engagement with different end-users. This suggests that there is a need to make the boundary work undertaken by research funders more visible to the grantee both during the contractual phase of the project, but also throughout the project life in its entirety. Further, this highlights the need for research funders to keep their grantees apprised of their efforts "behind the sciences" to engage with potential stakeholders and end-users of the project outputs.

10. Develop and fund "impact" monitoring after the research is completed. Given the timeframes between project completion and the "up-take" of new tools or knowledge, there should be an explicit focus on identifying, funding, and implementing tailored monitoring programs for after the project is completed. This could, for example, include the identification of indicators of success which are co-developed among research funders and the grantee, that are specific to the case study and the various "end-users," that are measurable over time.

Further, impacts from science on policy and practice are often non-linear, difficult to trace, and occur over mis-matched and protracted timescales (Pitt et al., 2018; Posner and Cvitanovic, 2019; Posner et al., 2020). Further, and particularly for older projects, it is very difficult to trace where people and products have gone, what impacts have been realized, and where there may be further opportunities for impact. Thus, it is essential for research funders to stay connected to the grantees after the research is complete. Our results suggest that this could take the form of an annual survey or check in with former grantees and project partners that would be recorded in a project and project partner database. This could also be used to identify future opportunities for research to inform decision-making, or to identify ongoing needs (e.g., financial resources, dedicated knowledge brokers, etc.) to continue to support and update project outputs over time.

CONCLUSION

In its 17 years of operation, the LOP has worked across a variety of contexts and piloted a number of different activities to provide funding that enables research to inform decision-making in marine policy and practice. The specific activities undertaken to support boundary spanning were less diverse than the project contexts, however, different strategies led to different outcomes depending on the context. Largely these strategies included workshops, webinars, the production of communication and engagement materials. Through investments in these strategies and boundary spanning staffing structure, LOP has observed a

variety of impacts. Similar to other studies, our research found that impacts can occur along a spectrum (e.g., developing a relationship with an end-users is of itself an impact, that can also lead to other impacts such as improved knowledge exchange), yet different interpretations of the word impact may not be readily apparent. As such, dialogue on what impact is and what it means to achieve it—with new staff, with new grantees, among projects teams—is critical. Definitions of impact will ultimately shape how research is conducted to realize those anticipated impacts, as well as how those impacts are measured.

Critically, how one approaches the question of impact is inherently tied to the interpretation of what knowledge is, and what it means to create and share it. As discussed in Louder et al. (2021), scholarship on the science policy practice interface contains a spectrum of understandings of knowledge ranging from a notion that it is certain, fixed, and able to be created in isolation of context and passed along, to a view where knowledge is conceptualized as always mediated through culture and worldviews, and co-created in a specific context. These different interpretations lead to the development of different ways of engaging in, and therefore funding, research that is situated at the interface of science, policy, and practice.

Given the diversity of contexts in which LOP—and indeed most research funders—works there is, no one, correct model for supporting research impact. This aligns with broader scholarship on boundary spanning and co-production that has not been able to settle on the "ideal" amount of iteration and engagement throughout the life of a project (Norström et al., 2020). As this can be unsatisfying for all operating at the interface, whether funders, managers, or researchers, we hope that the 10 lessons identified in this analysis can provide a starting point for research funders to consider in the design and implementation of their funding programs in the future.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available to protect the privacy and anonymity of research participants, and in accordance with human ethics approvals related to this research, data cannot be provided unless required by law. Requests to access the datasets should be directed to corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Australian National University Human Research Ethics Committee. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CC, CW, and AB conceived the study. CC and CW led the writing of this article, with input from all authors. All authors contributed to study design, data collection, data analysis, and data interpretation.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fmars.2021.704495/full#supplementary-material

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