

DISSERTATION

A CRITICAL EXAMINATION OF OBSTACLES AND OPPORTUNITIES TO BUILDING CAPACITY FOR  
COMMUNITY ENGAGED SOCIAL-ECOLOGICAL RESEARCH AND MANAGEMENT

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## ABSTRACT

### A CRITICAL EXAMINATION OF OPPORTUNITIES AND OBSTACLES TO BUILDING CAPACITY FOR COMMUNITY ENGAGED SOCIAL-ECOLOGICAL SYSTEMS RESEARCH AND MANAGEMENT

This dissertation seeks to contribute to more equitable and effective local governance and research of social-ecological systems. Specifically, I investigated efforts to enhance the distribution of influence and capacity, particularly to historically marginalized actors. This required critical evaluation of factors that influence whether and how interventions to build influence and capacity do so. Chapter one introduces the theoretical framing to this research, my positionality, and an overview of chapter organization. In my first two manuscripts (Chapters 2 and 3), I research underexamined elements of public participation in scientific research (i.e., delegated local ecological monitoring) as a proposed tool for building community capacity for resource management, particularly in developing economies. I seek to understand local ecological monitoring from multiple levels of influence- both the perspectives of resource-dependent participants, as well as from the perspectives of the program implementers. Specifically, Chapter 2 seeks to understand the experience of participants (i.e., small-scale fisherfolk with a role in the management of marine protected areas in the Philippines) to investigate the narrative that local ecological monitoring empowers communities to manage their social-ecological systems. I find that monitoring programs largely failed to be adopted by local communities, and rather than empowering participants, were perceived as burdens and a

reaffirmation of local hierarchies. My findings highlight the risks of uncritically applying ‘participatory’ approaches, and stress the need to recognize and design for the psycho-political contexts (e.g., agency) to achieve desired outcomes. In considering context, this study makes a novel contribution to the characterization of citizen science approaches, by distinguishing externally initiated programs in which monitoring is intended to become autonomous. In consideration of the failed outcomes in Chapter 2, Chapter 3 investigates the potential for win-win outcomes in citizen science by examining an understudied area- organizer rationales for engaging local participants in contributory programs in the Philippines. I find that organizer rationales for and perceptions of engaging participants were multiple, overlapping, and sometimes antagonistic, particularly regarding who is served, and who determines the objectives, suggesting that outcomes often framed as benefits in the literature may sometimes not benefit participants. To foster clarity and encourage reflexivity in citizen science programs, I map these findings onto the normative – substantive- instrumental typology of rationales to propose an adapted typology rooted in the realities of citizen science. Chapter 4 addresses the flip side of the participation equation by investigating how high- ‘cost’ community-oriented collaborative conservation practices are built and sustained among U.S. academics and practitioners. This retrospective program evaluation found that immersion into a community of practice, and obligations and opportunities to experiment with collaborative approaches fostered capacity- notably conviction for, awareness of, and comfort with collaborative conservation- resulting in long-term adoption of practice.

The findings in these studies shed light on important obstacles and opportunities for enhancing efficacy and equity in community-engaged research and management endeavors

increasingly sought in social-ecological systems. Notably, a pervasive thread to emerge from these chapters is the important role of intentional design using a systems-thinking approach, regarding linked social-ecological systems, multiple levels of influence, and temporal scales.

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TABLE OF CONTENTS

ABSTRACT .....ii

ACKNOWLEDGEMENTS .....v

CHAPTER 1: INTRODUCTION ..... 1

    1.1 Author positionality..... 1

    1.2 Theoretical Foundations..... 4

    1.3 Dissertation structure..... 7

CHAPTER 2: WHY LOCAL MONITORING FAILED TO SUSTAIN AND EMPOWER CO-MANAGEMENT OF MARINE PROTECTED AREAS IN THE PHILIPPINES..... 10

    2.1 INTRODUCTION ..... 10

    2.2 METHODS ..... 13

        2.2.1 Site and participant selection ..... 13

        2.2.2 Data collection ..... 16

        2.2.3 Data analysis ..... 16

    2.3 RESULTS ..... 17

        2.3.1 “I can do whatever I’m told”: Monitors as laborers with little expectation to catalyze monitoring ..... 17

        2.3.2 “I don’t really know what it’s for”: Unclear links between dLEM and local resource benefits ..... 23

    2.3 DISCUSSION ..... 27

CHAPTER 3: SITUATING DIVERSE AND CONFLICTING RATIONALES FOR ENGAGING LOCAL ACTORS IN SUSTAINABILITY RESEARCH: AN UPDATED TYPOLOGY FOR REFLEXIVITY IN PPSR ..... 35

    3.1 INTRODUCTION ..... 35

        3.1.2 Background and context..... 38

    3.2 METHODS..... 39

        3.2.1 Information and analyses ..... 40

        3.2.3 Data analysis ..... 41

    3.3 RESULTS..... 42

        3.3.1 Antagonistic rationales and operational procedures ..... 42

        3.3.2 Monitoring sustainability ..... 42

3.3.3	Appreciation.....	45
3.3.4	Management action.....	48
3.4	DISCUSSION.....	50
3.4.1	An adapted typology for reflexivity .....	53
CHAPTER 4: BUILDING CAPACITY FOR INDIVIDUAL AND SYSTEMS-LEVEL COLLABORATIVE CONSERVATION IMPACTS: INTENTIONAL DESIGN FOR TRANSFORMATIVE PRACTICE .....		57
4.1	INTRODUCTION .....	57
4.1.1	Center for Collaborative Conservation Fellows Program .....	60
4.2	METHODS .....	61
4.2.1	Study Population.....	61
4.2.2	Survey and Interview Design and Administration .....	62
4.2.3	Data analysis .....	63
4.3	RESULTS .....	64
4.3.1	Theme 1: Changes in Fellows’ Professional Practice and Trajectory .....	66
4.3.2	Theme 2: Intermediary Capacity Dimensions .....	67
4.3.3	Theme 3: Important Inputs to Collaborative Conservation Capacity and Practice .....	70
4.3.4	Theme 4: Systems-level Impacts of Collaborative Projects .....	75
4.4	DISCUSSION.....	76
4.4.1	Situating Individual Impacts .....	76
4.4.2	Situating Capacity Building Inputs .....	77
4.4.3	Balancing Individual Capacity Development with Systems-level Impact .....	79
4.5	CONCLUSION .....	83
CHAPTER 5: CONCLUSION .....		84
REFERENCES .....		90
APPENDIX A .....		123
APPENDIX B.....		127
APPENDIX C.....		133

## CHAPTER 1: INTRODUCTION

### 1.1 Author positionality

I was first introduced to the concepts of positionality and epistemology and how these influence my research, often unconsciously, during my PhD. A researcher's positionality is influenced by their background, beliefs, and personal experiences with research domains, which in turn shape what a researcher chooses to investigate, their framing, the methods they select, their relationship to the people involved, and their interpretation of the information gathered (Khagram et al., 2010). I am now better able to recognize that various aspects of my background have influenced, and continue to influence my work and research.

I am a White, able-bodied, cis-woman who grew up in a mostly White, middle-class suburban neighborhood in St. Louis, Missouri. Despite this, or perhaps because of it, much of my identity as a child and young adult was wrapped up in being multi-cultural. As the child of immigrant research geneticists from "Eastern" Europe, I grew up "different" – i.e., with multiple languages and customs in the home. I spent summers at my grandparents' home in coastal Yugoslavia (now Croatia) during the Communist era, and having two very different "homes" - each with distinct languages, foods, landscapes, history, political regimes and cultural norms, instilled an early affinity for diverse ways of being.

At the same time, these early contrasts provided first-hand exposure to stark inequalities- in incomes, services, and opportunities. My mother's personal accounts of maneuvering and escaping oppressive regimes – including the impacts of Nazi occupation and war, followed by communist rule, propaganda, and loss of rights, safety, and choice, helped personalize these

contexts. This exposure, combined with my own experience as a (psychologically and physically) abused child, and the resulting stint with financial and housing insecurity, sparked an early sense of injustices and a tendency to question rules and convention. Later, identifying as LBGTQIA+ and developing unseen medical conditions strengthened both an understanding of and interest in systemic bias, and the recognition that people carry diverse and hidden realities. These experiences contributed to a more expansive, less binary way of viewing the world.

However, despite some early hardships, I benefitted from many privileges, including able-bodied privilege, pretty privilege, and those bestowed to White, academically successful extraverts. I was largely unaware of many of the systemic injustices affecting the Black residents both in my own city, and globally. St. Louis in the 90s was a highly racially and economically segregated city, but systemic racism and structural inequalities were not topics in the news, at school, or in other forums. I didn't feel threatened or oppressed by those around me. Only when I had moved to places where my skin tone, way of speaking, and dress were noticeable, such as Ecuador and Puerto Rico, did I begin to experience being "othered", despite continued privilege.

Many of the aspects attractive to me about Croatia related to its limited amenities, fewer restrictions, and closer access to nature. When in the Midwest, much of my formative recreation as a latch-key tomboy also revolved around being outdoors. An early affinity for languages, combined with a desire to return to areas which reminded me of Yugoslavia, and "protect" the environment, propelled me into the fields of conservation and sustainable development. This led to work in remote field sites, developing regions, and eventually with resource-dependent communities. Although I was motivated by environmental "justice", my early education and work lacked explicit exposure to such concepts as co-production or community-based collaboration.

Instead, the positions I held prior to my PhD – e.g., in environmental policy, environmental education, as a marine protected area manager, and backcountry ranger- largely designed, inspired, and enforced “desirable” behavior and outcomes, without the engagement of stakeholders. Even the systems approaches I studied, which acknowledged structural and institutional influences (i.e., political ecology and social-ecological resilience / coupled human and nature systems theory), focused on the *natural* environment, without explicit or equal consideration of local people.

I entered the domains of collaboration and participation out of necessity while working as a protected area practitioner in Puerto Rico, and was struck by the reticence of local actors to engage. Recognizing that conservation necessitates focusing on people, I entered my PhD with the intention of understanding how participation in scientific research impacts learning (mental models), attitudes (perceptions of legitimacy, salience), behavior (compliance), and vocation. But again – I approached these questions from an unacknowledged position of power, doing research on programs that determined what the participants would learn.

It wasn't until I entered the field during my PhD that I began to recognize and question my assumptions, and those of the conservation field. I had entered my PhD as a practitioner, attempting to solve problems, and viewing participation as a tool to improve conservation outcomes. I conducted parachute science (Asase et al., 2021). It was the wholesale failure of the programs I was studying (i.e., the loss of treatment groups) that provided the impetus to pivot from research *for* conservation to research *on* conservation (Sandbrook et al., 2013). This precipitated a shift from a focus on improving conservation outcomes (i.e., participation as a tool to *contribute* to conservation), to facilitating more socially equitable and just processes through

more holistic, systems-perspective understanding. Although my work continues to be generative in its desire to innovate desirable practices for conservation, it is also reflexive and disruptive, basing that innovation in the interrogation of underlying assumptions.

## 1.2 Theoretical Foundations

Addressing the causes and consequences of sustainability issues while achieving social and ecological benefits is a global challenge (Marvier & Kareiva, 2014). Understanding the complexity and uncertainty that typify global environmental change within coupled social-ecological systems is critical to responding effectively. Participatory approaches involving integration across sectors, disciplines, and with stakeholders and local actors are increasingly popular in the context of social-ecological systems (SES) governance, management, and research (Berkes, 2010; Cinner et al., 2021; Feist et al., 2020; Rai et al., 2021; Steger et al., 2020). Devolved and participatory governance and management approaches include co-management, collaborative conservation, and community based natural resource management (CBNRM). In addition to rectifying shortfalls in centralized capacity (Armitage, 2005; Feeny et al., 1990; Hara & Nielsen, 2002), these participatory approaches acknowledge peoples' rights to greater control over changes to their SES (Stringer et al., 2006), as reflected in the 1998 Aarhus Convention on the public right to participate in environmental decisions (UNECE, 2019). Participation is a core element of good environmental governance, contributing to equitable, effective, responsive, and robust governance (Bennett & Satterfield, 2018). Participatory approaches to governance and management are particularly important given the increasing recognition of the role of local and Indigenous Peoples in stewarding social-ecological systems, both in protected areas and on private lands (Bennett et al., 2021; Garnett et al., 2018; O'Bryan et al., 2021; Sterling et al., 2021).

Proponents argue participation enhances the likelihood of achieving and sustaining both ecological and social outcomes, and supports transformations toward more just societies (Galvin et al., 2018; Reid et al., 2021; Scott, 2015). Community-engaged approaches provide avenues for meaningful integration of diverse user values and perspectives, enriching decision-making inputs and management decisions, and improving local salience of resulting actions (Reed, 2008; Fernández-Giménez et al. 2019; Sterling et al., 2017). Community ownership of the processes and outputs can increase the likelihood that decisions will be implemented and produce enduring, culturally and ecologically appropriate impacts (Berkes, 2010; Christie et al., 2002; Mulrennan et al., 2012; Pomeroy et al., 2005). Participation can also support the emergence of local and collective action (Reid et al., 2021; Claridge, 2004) and build capacity (Newig et al., 2018), both considered key to achieving win-win social-ecological outcomes in devolved SES management arrangements (Berkes, 2010; Brooks et al., 2013; Caves et al., 2013; Leisher et al., 2012). Inversely, capacity is also considered a precursor to meaningful participation in and ownership of SES management (Brooks et al., 2013; Leisher et al., 2012).

Although the importance of involving local actors has long been argued fundamental in resource management (Bennett et al., 2017; Christie et al., 2017; Cinner et al., 2016; Pomeroy & Rivera Guieb, 2005; White et al., 1994), sustainability science is also increasingly turning to public participation to facilitate sustainability. Public participation in scientific research (PPSR) (Bonney et al., 2009) encompasses a spectrum of research and monitoring activities that integrate, to various degrees, members of society whose primary training and/or employment is not scientific research (Miller-Rushing et al., 2012; Shirk et al., 2012). PPSR has theoretical overlap with a wide range of domains and is referred to by a variety of often interchangeable terms (Kullenberg &

Kasperowski, 2016), including citizen or community science, community-based or participatory monitoring, extreme citizen science, transdisciplinary science (Cundill et al., 2015; Klein et al., 2001), co-production, collective action (Poteete et al., 2010), and common pool resource or common property regime (CPR) theory (Agrawal, 2001; Cox & Arnold, 2010; Ferraro & Agrawal, 2021; Ostrom, 1990).

Yet despite the win-win rhetoric, and widespread adoption of participatory approaches in research, management and governance, participation remains a poorly defined concept (Ross et al., 2016; Woolley et al., 2016) with unresolved issues. Questions about who participates, why, in what capacity, and on whose terms (Bailey & Grossardt, 2010; Cleaver, 2007; Newig et al., 2018; White, 1996) remain. Likewise, public participation in scientific research remains a poorly defined theoretical concept. This research responds to a call to address how participatory measures should be approached and implemented, and to explore the perspectives of local actors (Funder et al., 2013). Understanding how capacity for community-engaged governance, management, and research of social-ecological systems is built is a critical step in improving how effectively and equitably the dual goals of meeting human needs while sustaining ecosystems and the benefits they provide can be met, and where they fail. My research contributes to effective and equitable governance by investigating the underlying assumption of interventions intended to enhance the capacity of local actors to contribute to and influence the direction of their SES, and suggesting innovations for desirable practices. I focus on these processes and outcomes in two contexts: devolved local ecological monitoring in co-managed marine areas in the Philippines, and capacity building for community engaged collaborative conservation professionals in the U.S.

### 1.3 Dissertation structure

The following dissertation is comprised of three main chapters. In Chapter 2, I present a case study of the local experience with delegated local ecological monitoring (LEM) programs in the Central Visayas, Philippines. Through interviews with LEM trainees and community members – primarily subsistence fishers associated with the co-management of local marine reserves, I investigate the narrative that participation in ecological monitoring empowers local communities and builds management capacity. My research indicates that LEM largely failed to be adopted (i.e., did not sustain) and was not perceived as useful once initiating organizations withdrew. Rather, delegated LEM was perceived as a burden and as reaffirming existing hierarchies, highlighting the risks of uncritically applying “participatory” approaches. Further, failure of programs to design for the psycho-political context of participant communities (i.e., limited agency) likely shaped these outcomes. This research is novel in that it: i) focuses on the local perspective on LEM, particularly in the context of resource-dependent communities; ii) investigates the continuity and utility of delegated LEM post implementation; and iii) contributes nuance to the characterization of monitoring schemes (and discussion of likely benefits) by defining the term *delegated local ecological monitoring* (dLEM) to distinguish externally initiated monitoring programs that transfer responsibility for sustaining monitoring to local actors.

In Chapter 3, I characterize the rationales of the organizations designing and implementing local ecological monitoring initiatives in the Philippines (including the subset discussed in Chapter 2) for engaging local actors. From interviews and a participatory workshop with key personnel, I find diverse and sometimes conflicting rationales and objectives for engaging local co-managers in

marine LEM. I then characterize these into a two-dimensional typology based on (i) who is perceived to be served and (ii) who sets the agenda. This model distinguishes itself from other frameworks and typologies in the literature on public participation in scientific research both in the domains it considers, and its incorporation of multiple dimensions. I map these empirical rationales onto a well-known (Normative – Substantive – Instrumental) typology of rationales (Fiorino 1990) to create an adapted model that both provides better functionality for practitioner reflection in program design, and integrates across fields for academic discussion of rationale and outcomes. This research is novel in its (i) focus on organizer rationales for engaging participants in scientific research; and (ii) contribution of an adapted typology to theory.

Chapter 4 represents the highest “rung” of my research on local participation. In this chapter I investigate the efforts of a program to increase the adoption of community-oriented collaborative practices in conservation research and practice. Using mixed-methods, I conducted a retrospective evaluation of a U.S. fellowship program building collaborative conservation capacity among academics and practitioners working globally. I find that the fellowship had transformative long-term impacts on participants, and that capacity – notably conviction for and comfort with collaborative approaches, was supported less by “training” and more by immersion into a safe community of practice which provided opportunities and obligations to experiment with collaborative approaches. This research also suggests that design elements which simultaneously attempt to enhance systems-level impacts (i.e., conservation gains) may represent tensions for individual-level gains (i.e., changes in capacity and practice). I make design suggestions to improve both long-term individual and systems-level outcomes. This research is

novel in its evaluation of a collaborative conservation program, and its focus on the key processes which support change, rather than solely outcomes.

In Chapter 5, I synthesize my findings across chapters 2-4 and discuss how these relate to the literature and needs for future research, as well as implications for conservation practice.

## CHAPTER 2: WHY LOCAL MONITORING FAILED TO SUSTAIN AND EMPOWER CO-MANAGEMENT OF MARINE PROTECTED AREAS IN THE PHILIPPINES<sup>1</sup>

### 2.1 INTRODUCTION

Participatory approaches are normatively popular in the context of social-ecological systems (SES) governance, management, and research (Berkes, 2010; Feist et al., 2020; Gurney et al., 2016), as a means to rectify shortfalls in centralized capacity (Hara & Nielsen, 2002), improve management decisions (Reed, 2008), and enhance the likelihood of achieving conservation outcomes (Scott, 2015). Proponents argue participation also supports transformations towards more just societies (Reid et al., 2021) and acknowledges local peoples' rights to have greater control over changes to their SES (Stringer et al., 2006). In parallel, ecological monitoring supports responding to global and local changes by informing new arrangements, and providing feedback on actions taken (Ferraro & Agrawal, 2021; Ross & Berkes, 2014; Webster et al., 2017).

As the potential nexus of these approaches, local ecological monitoring (LEM)<sup>2</sup> programs are advocated to ensure both consistent and inexpensive data collection (Aceves-Bueno et al., 2015; Fox et al., 2017; McLeod et al., 2009; Quintana et al., 2020), and to empower participating communities by situating knowledge production more fully with those affected by, and with the

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<sup>1</sup> This chapter will be submitted for publication with co-authors Kristin Hoelting, Jill Zarestky, Brett Bruyere, Liba Pejchar, and Gregory Newman

<sup>2</sup> Local ecological monitoring (LEM) is known by various names (e.g., citizen science, science with society, paraecology, community-based monitoring, ranger monitoring) and encompasses different modes of engagement and degrees of involvement and influence (Armitage et al., 2011; Danielsen, Burgess, et al., 2005; Hage et al., 2010; Kowler et al., 2020; Schmiedel et al., 2016; Shirk et al., 2012; Steger et al., 2020, 2021).

power to affect, environmental changes (Danielsen et al., 2021; Dickinson et al., 2012; Meyer et al., 2017). However, we know little about the long-term utility and sustainability of monitoring after partners withdraw (but see: Funder et al., 2013). Outcomes of LEM interventions are largely evaluated during or immediately following monitoring programs. The expectation that benefits persist is largely based on tacit assumptions that monitoring is being collectively adopted and sustained by the communities engaged. Additionally, there has been insufficient accounting for how and when benefits arise from LEM, particularly regarding participant communities, given the diversity within LEM design and community context. Fleeting NGO involvement makes understanding if and why monitoring is not adopted by participating communities critical to improving LEM's promise to global sustainability and local communities, particularly in developing regions. This case study provides important insights on barriers resource-dependent communities experience in realizing LEM's possible benefits.

The Philippines offers opportunities to better understand the sustainability and utility of LEM for devolved resource management, due to long-standing co-management arrangements between local government and community groups, used to establish LEM. Within this “hottest of the hotspots” for biodiversity (Magdaong et al., 2014 p3), marine protected areas (MPA) are the conservation tool most extensively implemented to address declining biodiversity and coral reef habitat (Cabral & Geronimo, 2018; Horigue et al., 2012). In tandem, local MPAs are primarily established to support food security for heavily resource-dependent communities (personal communication, A. Maypa). The Philippines small-scale fisheries support over 1.5 million people (Badiola et al., 2021), and are considered among the poorest and most food-insecure sectors (Cabral & Geronimo, 2018).

Community co-managed reserves have proliferated to over 1800 gazetted marine areas since the 1990s (MPA Support Network, n.d.; Weeks et al., 2010), after Philippine law devolved<sup>3</sup> co-management of coastal resources to the municipal governments with a *barangay* (i.e., village) level organization (e.g., fisherfolk cooperative; Pomeroy & Courtney, 2018). Most comprise small no-take areas (<25 hectares). However, up to 90% of Philippine MPAs have been rated ineffective (Beger et al., 2004; Pomeroy et al., 2005), due partially to inadequate management capacity at local levels ([www.ph.undp.org](http://www.ph.undp.org)).

Since 2000, investments by nonprofits, academic institutions, and government agencies, have driven sporadic, but widespread training in local ecological monitoring to build capacity of local co-managers in the Central Visayas region (Hauptfeld *unpublished data*). Advocated for in MPA management and small-scale fisheries (Nelson et al., 2019; Robertson et al., 2018) by the state, civic society organization and funders, LEM is institutionalized in the Philippines within criteria of the MPA Management Effectively Assessment Tool (MEAT), used nationwide to assess and trigger MPA management improvements (Maypa et al., 2012). Although the objectives for monitoring and rationales for including local participants in monitoring were diverse and often unspecified (see Chapter 3), organizations universally anticipated trainings to be short-term, transferring responsibility to local communities. We use *delegated local ecological monitoring (dLEM)* to denote local scale interventions initiated and/or supported by external partners, in which community members and local actors, who depend on or influence local natural resources,

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<sup>3</sup> Philippine Republic Act 7160 (1991) and Republic Act 8550 (1998) set the legal framework to establish co-management.

are engaged in, and expected to take ownership for the production and use of information regarding local resources.

This paper seeks to understand the perspectives on dLEM among monitor and co-manager communities and probe the narratives of participatory monitoring as a viable means to empowerment. Our research (1) asks whether dLEM has been adopted by trainees and participant communities, and (2) identifies factors that support or hinder dLEM adoption after facilitation by external partners ends. Specifically, we focus on (i) expectations of, and (ii) utility to monitors and community members from training, data collection activities, and information generated.

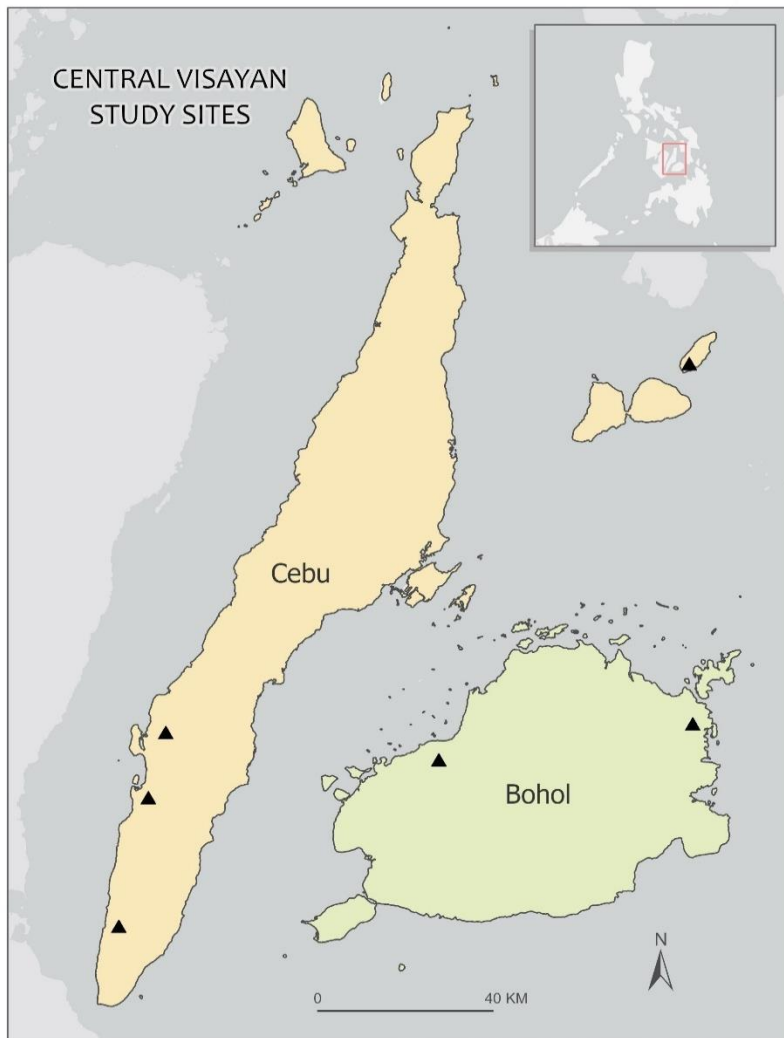
## 2.2 METHODS

### 2.2.1 Site and participant selection

This case study restricted candidate sites to *barangays* in the Central Visayan provinces of Cebu and Bohol with MPAs under co-management agreements between municipal governments and a *barangay*-level fisherfolk organization, thereby excluding large, nationally designated reserves (Figure 2.1). Additionally, at least one person (fisherfolk or municipal representative) must have received training in marine dLEM. Training could have been conducted by one or more of the NGOs, universities, provincial or federal agencies (hereafter *external partners*) active in the region. Although training organizations were varied the training protocols were consistent.

Trainings generally lasted two to three days, beginning with background lectures, followed by orientation to data collection methods on land, applied monitoring in the water, and graphing and presenting results. Participants used snorkel, traditional goggles, or scuba, to collect data using variations of the methods designed for local coral monitoring by Uychiaoco et al.,

(2001). Participants were trained to collect data on benthic cover (e.g., *live hard coral*, *dead hard coral*, *rubble*) using point transect, line transect, and/or quadrats; and fish abundance and diversity (e.g., to the family or species level) using fish visual surveys along transects. Training sometimes included methods for adjacent mangrove or seagrass areas (e.g., manta tow). Fish were primarily identified using scientific nomenclature to account for regional naming differences, and sometimes using local Bisayan (i.e., Cebuano) names. Most monitors were chosen to participate in dLEM training by their fisherfolk organizations, or municipal staff.



Map created by Olivia Doebr, Geospatial Centroid. Source: Esri

Figure 2.1: Triangles indicate approximate locations of the six municipalities co-managing 11 MPAs (within 12 *barangays*) in the Philippine provinces of Cebu and Bohol.

Trainees were often assigned to teams or pairs to collect fish or benthos data. Trainees were usually residents of the barangay in which training occurred, but cluster training of participants from several *barangays* and/or municipalities also occurred. Trainings generally provided food, transportation (if applicable) and financial support, such as a daily wage.

This study attempted maximum variability sampling to compare sites where monitoring had sustained with those where it ended. However, key informant interviews with external partners and municipal representatives during site selection yielded no definitive sustained monitoring sites. To assess reasons for limited uptake and persistence, we investigated sites where training concluded two or more years prior, and where partners indicated monitoring sustained independently for a period. Eleven MPAs in 12 coastal *barangays* within six municipalities (Figure 2.1) are represented; one MPA was managed between two barangays.

We attempted a census of monitors identified by external partners and municipal officials as trained in each *barangay* (generally two to eight men). A field assistant and local liaison helped contact respondents. We then asked respondents to identify additional people they believed had been trained. We spoke with approximately 80% of monitors identified by external partners and in residence at our sites, plus local officials and individuals recommended by monitors. Monitors were primarily small-scale fishers who belonged to or held leadership positions in the fisherfolk organizations designated to co-manage each MPA. These were sometimes MPA guards (i.e., *bantay dagat*), or *barangay*-level or municipal-level government representatives, or a combination. ‘*Monitor*’ is used although monitoring sometimes did not follow training.

### 2.2.2 Data collection

We conducted 37 semi-structured interviews (individual and group) with 34 monitors plus additional 25 local actors (e.g., MPA guards, fishers, fisherfolk organization representatives, and barangay government officials). Interviews were conducted from July to October 2017 and June to July 2018 as part of a broader case study. Fishers sometimes elected to interview in pairs or with family present. Interview questions (see Appendix A) addressed respondent experiences with dLEM, perceptions of purpose and utility of training and monitoring, expectations, perceived obstacles and motivations, and perceptions of resource change and marine issues of concern. Interviews were flexible to allow themes important to participants to emerge, and a modified grounded theory approach was used to adapt interview guides to incorporate themes expressed by previous participants (Charmaz, 2006). Interviews were conducted primarily in Bisaya, through native-speaking field assistants who iteratively clarified questions and responses. At each interview's start, the lead researcher and field assistant(s) explained the research purpose and researcher affiliation, emphasizing that there were no right answers, and that interviews would remain confidential. When permission was given, interviews were audio recorded for transcription. The research was conducted in accordance with ethical standards from Colorado State University (IRB #2920 previously 17-7192H).

### 2.2.3 Data analysis

Bisaya interviews were translated to English by native-speaking translators (Appendix A for details). English transcripts were coded using inductive thematic analysis using iterative open and categorical coding (Braun & Clarke, 2012; Saldana, 2009) to extract meaning from both the topics discussed and those omitted by respondents. Qualitative data analysis software (MaxQDA

Version 20.4.0) and online platform Miro were used to identify and relate emerging patterns to form descriptive and inferential themes and to link these to literature. The first author engaged in weekly peer debriefing to support reflexivity regarding theme development. Respondents were assigned aliases and codes that signify their municipality and barangay. For instance, *Kaiser, 3K monitor* and *Manny, 3M monitor* are monitors from two barangays (K and M) both within municipality 3.

## 2.3 RESULTS

Of the locally co-managed MPAs in the Central Visayas that received dLEM training, 12 were identified by external partners as potentially having sustained monitoring without the facilitation of an external partner after training. Only one had actually done so. Across the sites we visited, monitors shared a narrative of dLEM as primarily employment, and of monitors as laborers with little expectation to propel monitoring independently, instead deferring to external partners to make decisions (Section 3.1). Further, monitors and local actors perceived few clear ties between dLEM and local action to enhance resources (Section 3.2), identifying others as consumers of the information generated. Expressions of low agency permeated both themes.

### 2.3.1 “I can do whatever I’m told”: Monitors as laborers with little expectation to catalyze monitoring

Despite commonly identifying fisherfolk as the preferred group to conduct dLEM, monitors did not express a parallel expectation for the same community to propel or sustain monitoring. Instead, respondents’ narratives depicted training and monitoring alternately as obligations of and opportunities for employment and personal gain. Monitors consistently expressed reliance on others to catalyze monitoring and make decisions related to monitoring

and resource management more broadly, and a perception that their dLEM engagement was in service to external partners.

#### 2.3.1.1 *“Without support, we are nothing”*: Monitors rely on others.

Despite consistently identifying fishers as the preferred group to conduct monitoring, monitors echoed the expectation that they be recruited to action and organized by others, rather than catalyze monitoring collectively. As monitors from two sites reiterate:

*“We already know how to get the data, but we just await the call to do a monitoring activity.” (Elcid, 5E monitor); “We will just wait [to monitor]. It is part of our job. We will just wait for their request.” (Manny 3M monitor)*

Some monitors, however, had little expectation that monitoring would continue, as they did not distinguish between in-water *training* and *monitoring* activities. Other marine wage opportunities followed similar ‘preparatory’ sequences to dLEM, but without the expectation of independent action. For instance, monitors indicated that giant clam seeding, coral planting, and marine monitoring in neighboring municipalities also began with orientation to new equipment, tools, and methods.

Broadly, respondents expressed reliance on others (e.g., external partners, maritime police, municipal and barangay officials) to provide resources (e.g., compensation, equipment), technical assistance (e.g., accompaniment and oversight of data collection, analysis) and decisions regarding monitoring (e.g., what, when, and who should monitor). Monitors expressed insufficient confidence in basic adjustments to monitoring protocols (e.g., direction of data collection along a transect). One fisher’s deference to external partners to determine appropriate topics and frequency of training, and to assess trainees’ readiness, exemplified this reliance:

*“If it’s only up to us, we would have wanted the training to go on and on and on. However, we follow their judgement and assessment of us. When they said ‘you can do the*

*monitoring on your own, even without us around', we're like, 'so we are now knowledgeable enough, as they would now let us do monitoring on our own!' We just follow what they say in their evaluation of us." (Jay, 1J monitor)*

When asked who they believed should decide what to monitor, one fisher's response reflected reticence in making such a decision:

*"It would be best if it would be the Mayor who would decide on that [what to monitor] because the Mayor is the one who funds it... The Mayor should be the one initiating, giving the instructions because it would be difficult in case something fails, you would be blamed, or reprimanded." (Michael, 3M monitor)*

Monitors sometimes depicted their ideas and capacity to contribute as inadequate, saying, for example, *"we [fishers] are not keen enough to have notions how to stop the deterioration of our seas" (Davinder, 4D monitor)*. Monitors who had been trained using scientific names referred to local Bisaya names for fish as "nicknames" (Gener, 2G monitor) and scientific names as "real" names (Abe, 6A monitor), or commented on not having retained scientific names and skills. Monitors expressed a sentiment that *"it's better that we are trained"* (Manny, 3M monitor) so as not to remain "ignorant" (Maximo, 3M monitor), and sometimes expressed concern that the names, methods and tools previously acquired may have changed or advanced.

### 3.1.2 "We cannot remain volunteers forever": Monitoring as employment and personal gain.

Interviews indicated that monitoring was perceived as both an opportunity to earn money and gain access to benefits not otherwise available, and an obligation. Respondents consistently identified fishers as the preferred group to conduct dLEM, and interviews revealed that the potential for income was the primary driver. Income and financial issues dominated discussions, and respondents brought up or returned to finances without being prompted, related to their interest and participation in monitoring, the fisherfolk organizations, and MPA

management. An expectation of payment for monitoring was nearly ubiquitous among respondents who anticipated monitoring would follow training. As one monitor summarizes:

*"...fisherfolk... are expecting [income] since they are working for subsistence for their family." (Davinder, 4D monitor)*

Monitors received daily wages or meals during training sessions, making training events *de facto* earning opportunities. Monitors also expressed appreciation for the opportunities not readily available to fishers, such as scuba certification, diving within the protected area, travel, and learning. Learning interests varied from personal curiosity (e.g., seeing what is underwater; training for the experience), to learning how to protect the ocean, and gaining skills for employment. Some respondents indicated trainers had told them they would be hired for their new skills. One monitor summed up the vocational value of dLEM training as:

*"...[training] is really useful. At least whenever someone would ask us to do seagrass monitoring, measuring mangroves, doing quadrats, and so forth, at least we have the knowledge to do so." (Fausto, 5F monitor)*

While monitors cited logistical challenges and concerns about physical comfort and safety as impediments to monitoring, lack of remuneration was the most consistently ascribed reason for monitoring stopping.

*"Why has our self-motivation waned? It's because we cannot remain volunteers forever. We have to feed ourselves. That's why [unpaid monitoring] is not sustainable." (Kaiser, 3K monitor)*

Respondents emphasized that subsistence fishers would not and could not monitor, or participate in other resource management activity without wages, meals, or other compensation for lost earnings, much less shoulder the financial burden associated with independent monitoring, such as boat fuel and gear.

*“They don’t [monitor] because it will cost them their daily income [from fishing], which that’s really unfortunate.” (Hosseini, 2H monitor)*

At the single site where monitoring had continued, data collection was a duty of a (comparatively well-) paid position (*bantay dagat* or local MPA guard), and monitors indicated that successfully monitoring (as part of the MPA mandate) determined whether they would receive ongoing support from external partners and secure other funds, such as MPA awards. Expecting payment applied broadly to other tasks as well, including coral planting and coastal clean-up. One group of monitors and local MPA guards bemoaned that they were unable to motivate fellow fishers to build fish aggregating devices (FADs), despite having the materials on hand, saying:

*“If there’s no budget, we can do nothing. There are actually bamboos that we can use [to build FADs]. But it’s just that we don’t have anything to give to those who work for it.” (Doyle, 4D monitor)*

Additionally, respondents sometimes expressed an obligation to participate in dLEM training, data collection, and other trainings and meetings organized by external partners, the municipality or fisherfolk organizations, as part of their membership in a fisherfolk organization or MPA-related role (e.g., local guard *bantay dagat*). Most monitors indicated they had been chosen for or assigned to participate in dLEM training, and some perceived they needed to demonstrate their suitability to external partners. Fishers tended to identify individual characteristics related to their capacity to complete tasks (e.g., I am dependable; He can hold his breath underwater) as reasons they had been chosen. None identified their roles related to MPA co-management. While monitors sometimes called upon fellow fishers to share paid monitoring opportunities, monitors did not indicate they trained others to monitor. At one site, monitors perceived neither need nor space for additional members for their four-person paid monitoring

team (Alvin, 6A monitor); at another, monitors indicated they were “waiting for a signal from [external partner]” (Michael 3, monitor) to train new people.

### *2.3.1.3 “A way for them to avoid the inconvenience”: Local participation to fulfill a service to external partners*

When we asked monitors their perception of the rationale behind involving fisherfolk in dLEM, monitors either responded that they did not know, or proposed aspects of convenience to organizers. For instance, to alleviate partner workloads or time burdens, and/or reduce expenses compared to hiring professional monitors.

*“It could also be a way for them to avoid the inconvenience to keep on coming here, so they just entrust [monitoring] to us.” (Jay, 1J monitor)*

Some perceived that external partner organizations needed additional manpower for which their proximity to and familiarity with the area made fishers more expedient to train and to respond when needed. One fisher reflected:

*“It would not make sense if they chose [to train] those who work inland. So fishers were chosen! It’s important as well that the fishers are from here, for familiarity with the area. It would not make sense that the farmers would survey the sea and not us.” (Herman, 2H monitor)*

Others expressed the sentiment that external partners had chosen fishers to transfer undesirable tasks to them. One monitor reflected:

*“If you are from DENR, wearing your uniform, would you go down into the muddy mangrove area, with rocks full of barnacles? No. You would not do that. Those that they trained were the ones who went down to the mangroves [to get dirty]. They [DENR] just instructed the trainees how to do it and what to record. That was our role.” (Alvin, 6A monitor)*

Reasons did not include sharing power or augmenting fishers’ collective disposition for decision-making. Even respondents who explicitly identified the relationship between the

fisherfolk' association with an MPA, spoke of conveniences to external partners, saying they were selected:

*"Because ... [we] the people have an organization that is [connected] to the sanctuary. That is why we were the ones trained, because of the proximity [to the sanctuary]. Anything that needs to be [done] could be done sooner." (Herve, 2H monitor)*

### 2.3.2 "I don't really know what it's for": Unclear links between dLEM and local resource benefits

Next, interviews revealed respondents did not identify monitors, fisherfolk organizations, nor local communities as consumers of the information generated, despite many respondents holding leadership positions in organizations with co-management roles. Instead, data were consistently perceived as being produced and archived for third parties. Moreover, monitors were unclear on monitoring's purpose and the dLEM information's local relevance, approaching the dLEM products as deliverables rather than an input for individual or collective decision-making.

#### 2.3.2.1 "I'm just only following their instructions": Producing dLEM information for others

In parallel to perceiving participation in dLEM as a service, monitors consistently identified others as the data consumers. Monitors described collecting data for or submitting and reporting data primarily to the NGOs, universities, and municipal governments who had organized and/or paid for data collection.

*"I don't know about the effect [of monitoring on the MPA]. I just only help them gathering whatever they want." (Davinder, 4D monitor)*

Respondents in more than one barangay reported maintaining monitoring data to report to third parties who might inquire, saying the value of the data was:

*"So we would know the status, because [otherwise] if somebody comes and conducts an interview, we would be clueless." (Bernardita, 6B barangay government)*

For some respondents, monitoring was driven by benefits to external partners, or to comply with federal or MPA mandates, for instance.

*“[The] monitoring team is created as part of the management plan... It’s mandated that monitoring is a must and that it must be done twice a year. That’s the reason we are doing it.” (Jesus, IJ monitor).*

At some sites (2G, 4D, 6A) monitors perceived external partners profited from their work, submitting the data as a means to secure money from funders or government.

*“I don’t know what they did with those [data]. Perhaps they would use them for their exhibit to show that those were the products of their trainees. They would use them [data] to collect money. Their pockets would then be happy! Ours would just be the crumbs!” (Gener, 2G monitor)*

### 2.3.2.2 “Guessing the whys and the wherefores”: Unclear rationale and local applications of dLEM

Respondents were largely unclear why monitoring was conducted and how the dLEM information would and could be used locally. The sentiment “I really don’t know what it’s for” (Anacleto, 6A monitor) was common. Ambiguous links to action were sometimes expressed as lack of distinction between dLEM skills and other skillsets and activities, particularly scuba (which participants discussed more often and in greater detail than dLEM methods), as well as MPA guarding, data entry in *bantay dagat* (aka MPA guard) logbooks, and fisherfolk organization trainings (including bookkeeping).

Among respondents who articulated a purpose to monitoring, the most common was a sense that monitoring can benefit the ocean and “nurture the sanctuary” (Herve, 2H monitor). However, specific linkages between dLEM and local options for management action to support MPAs or fisheries were ambiguous or absent across sites, including the site where monitoring had continued. The exception was a common call for more and better supported enforcement in response to hypothetical observations of reduced fish within MPAs, including better gear for local

guards (e.g., boats, spotlights, radios, electricity) and greater police and municipal support punishing violators, reflecting a desire for increasing efficacy and *bantay dagat* safety.

A subset of respondents indicated dLEM was intended to determine the status of and changes in the MPAs. Yet, even these monitors consistently described others as users and beneficiaries of the information (section 3.2.1), or linked knowing with bolstering compliance and community MPA support, rather than as an input for local decision-making (see section 3.2.1) (Figure 2.2). One fisher indicated that knowing and disseminating (positive) MPA status supported the ultimate goal of enhancing potential tourism revenue:

*“So the people would be motivated once they learn the progress of the sanctuary, that there are now more corals and fish... So residents of [the barangay] will get excited, feel proud and spread the good news about the sanctuary.... So [barangay 2H] will become popular and we’d get more visitors who wants to see the sanctuary in [barangay 2H]. That’s what we envision. (Herman, 2H monitor)”*

Another shared that unfavorable monitoring results “would be the subject of the lecture [by Municipal staff to fisherfolk]...that it [low fish numbers] is the result of constant stealing of fish there” (Michael, 3KM monitor).

Notably, the few monitors who reported changes in fish size or number noticed these via non-technical observations (e.g., from the guardhouse, from a bridge, or during MPA buoy maintenance), not during, or as a result of, dLEM data collection. Others said the presence of (legal and illegal) fishers in and near the sanctuary was a sufficient indicator of MPA success, stating:

*“Even without underwater monitoring, the people – especially those living in the coastal barangays, can still determine if the sanctuary has abundant fish.” (Maximo, 3M monitor)*



Figure 2.2. Depiction of the perceived users (center light grey bubbles) and uses (right column bubbles) of monitoring data, among the subset of respondents who indicated the purpose of monitoring was to understand changes in or the status of an MPA (left green bubbles).

Although monitors expressed appreciation for learning gained through dLEM programs, particularly regarding how to reduce harmful practices, they made few functional distinctions

between monitoring and outreach, further highlighting poor conceptual connection between monitoring and application. Monitors at only one site indicated their monitoring had inspired community members to inquire what they were doing. These monitors reported using this opportunity to disseminate lessons on appropriate behaviors, rather than information gathered through, or related to monitoring.

The limited expressions of dLEM applicability sharply contrasted with frequent references to dLEM's technical and procedural aspects, and expressions of confusion or discomfort related to these aspects (e.g., graphing, presenting, submitting reports). This included a perceived inability to use or share dLEM information because of a lost graph, or other technical shortcoming. One fisherfolk organization representative epitomized the perceived barriers presented by a focus on technical products:

*“We [the fisherfolk group] really could not [monitor on our own], for if we insist on doing the assessment, we would be at a loss on what to do next. We would only be guessing the whys and the wherefores, like where to submit our findings.” (Anjo, 6A monitor)*

Monitors at only one site inquired whether steps existed beyond graphing.

## 2.3 DISCUSSION

Our research suggests the decades-long and region-wide dLEM interventions in central Philippine MPAs largely failed to sustain or evolve into collective efforts by local monitors, despite holding positions in organizations with co-management roles. Monitoring ceased despite attempts by implementing partners to build dLEM into existing co-management institutions at multiple levels (e.g., barangay and municipal), and to employ simplified methods and locally reproducible technologies, and leave data with communities, as suggested (Cundill & Fabricius, 2009; Danielsen et al., 2005a; Danielsen et al., 2005b; Eiken, 2021). Further, we found little

evidence that participation in dLEM resulted in empowerment, democratization, or enhanced co-management, despite assertions of its potential to do so (Camino et al., 2020; Danielsen et al., 2021). Instead, we found evidence that dLEM presented a burden to monitors, reaffirmed hierarchical relationships, and at times undermined participant agency as it sought to build (technical) competencies. These realities echo suggestions that sustainability of externally initiated monitoring programs may be less commonplace than indicated by the wider literature (Garcia & Lescuyer, 2008; Holck, 2008; McKay & Johnson, 2017) and further suggest that contributions to community empowerment may be more elusive than hoped.

Whereas participation is broadly considered an integral step towards empowerment, our findings contribute to evidence that devolving monitoring of globally significant resources to resource-dependent communities can confer burdens to participants (Bailey & Grossardt, 2010; Royer et al., 2018; Shrestha & Ojha, 2017; Staddon et al., 2015; Wiber et al., 2004) particularly when intended to be catalyzed locally without ongoing external support. Although opportunities to generate income were a priority to respondents, wages and other dLEM benefits, including opportunities for travel and learning, were all features of external facilitation (i.e., accompanied or curated by external partners), rather than of the data or data collection activities *per se*, and therefore not readily reproducible by fisherfolk monitors during autonomous monitoring. Neither the data nor the act of monitoring independently was linked to clear or locally actionable steps to improve marine resource management. Unlike monitoring arrangements which provide patrol co-benefits and reduce intrusions or generate revenue from violators (Danielsen et al., 2011; Funder et al., 2013; Topp-Jørgensen et al., 2005), (planned) biannual monitoring presented too few potential interactions to contribute substantively to the existing guarding regimen.

While sustainable benefits were unclear or elusive, monitoring independently was perceived to entail costs too great to be borne by fisher monitors or their organizations. In the absence of wages, anticipated expenses and lost earnings from fishing factored heavily in LEM stalling. Beyond budgetary constraints, monitors cited age, cold, physical strain, and safety concerns as reasons for relinquishing their participation on monitoring teams. Quintana et al., (2020) similarly found even well-paid fishers in Mexico sometimes perceived the wage to be insufficient for the perceived risk of scuba monitoring.

Fundamentally, monitors in the Central Visayas did not perceive that their participation in dLEM had or was intended to transfer power to them. Participants across sites portrayed themselves as purveyors of “cheap labor” (Turreira-García et al., 2018) in service to external partners, with limited agency to choose whether to participate, to influence dLEM processes, or to interpret and respond to the information generated. Monitors’ comparative emphasis on the technical tasks and products of dLEM (as with MPA co-management tasks more broadly (e.g., maintenance of buoy and lines, beach cleanup, enforcement), rather than its application, suggests that dLEM constituted increases in responsibility of co-management without concomitant increases in influence. Interestingly, we found decision-making responsibility around dLEM can itself be perceived as a burden, as evidenced by monitors’ reticence to assert opinions or shoulder decision-making in monitoring programs. Such reticence may have been enhanced by the perception of others as the drivers, users, and beneficiaries of the work and information generated. Hence failure to catalyze and maintain monitoring independently reflected not only insufficient financial and logistical support to do so, but an absence of perception of fisherfolk

and local communities as consumers of the information produced. Instead, LEM was perceived as something that external parties do and care about.

The expressions of deficit we heard may have been fomented by the focus on technical components, including data collection, graphing, reporting, and the use of scientific names. Previous studies have found that framing of citizen science initiatives can influence participant agency (Lin-Hunter et al., 2020) and that strong emphases on building scientific and technical expertise, while overlooking local knowledge and concerns, as was the case at our sites, can legitimize existing power relationships (Chambers et al., 2021), particularly in developing countries (Adams & Sandbrook, 2013). The legitimacy attributed to Western science can override local knowledge and knowledge systems (Baker et al., 2019; Chambers et al., 2021). Without explicitly acknowledging or building upon previous learning, training by multiple external partners appeared to have undermined monitors' confidence in the utility and applicability of previously-acquired skills and knowledge, inadvertently eroding participant agency while trying to build technical capacity. We found this erosion can occur even as participants appreciate the opportunities for participation and learning. A conspicuous absence of training on LEM application further corroborates that a technical focus can hinder achieving outcomes, such as institution building, which facilitate collective action (Chambers et al., 2021), a goal of many externally-initiated monitoring programs.

The burdens we noted and elusive nature of empowerment were influenced, in part, by the psycho-political context within which the dLEM was implemented, and the failure of dLEM programs to explicitly address and accommodate for these in their design and participant selection. The limited agency and opportunity structure (Alsop et al., 2006) among monitor and

co-manager communities hindered the easy application of LEM and subsequent benefits. Some initiatives that successfully support local actors to exert control vis-à-vis more powerful actors (Buntaine et al., 2021; Funder et al., 2013) benefit from opportunity structures which facilitate benefits. For instance, independently producing water-quality data allowed First Nations and Alaska Native Tribes to embody cultural commitments to land stewardship by ensuring government and industry meet obligations to remediate legacy contamination (Wilson et al., 2018). Unlike these initiatives, no framework existed to use Philippines dLEM data to hold commercial fishing accountable for threats to food security, for example.

In addition, respondents expressed limited agency to influence what, when, where, how, why and who would monitor, or to interpret and respond to the information generated. Despite formal co-management arrangements, informal constraints on the exercise of choice, and even the perception that choice exists (Cleaver & Whaley, 2018; Rabby & Hossain, 2019) may have hindered the ability of co-manager monitors to influence and adapt dLEM for locally-salient needs. Constraints on choice may prove difficult for local decision-making arrangements or participatory projects to overcome (Cleaver, 2007). As one of the poorest and most marginalized sectors in Philippine society, fisherfolk are particularly susceptible, given that the very characteristics of marginalization (e.g., hunger, obligations, and dependence on wealthier and more powerful community members) constrain choice (Cleaver & Whaley, 2018). Despite limited agency, fishers shared several MPA roles available for fishers and ways in which fishers influenced marine resources inside and outside of MPAs. By far the most emphasized role was enforcement (i.e., *bantay dagat* or local guard), reflecting respondents' primary concern of illegal and destructive fishing practices on resources, as well as planting coral, removing predatory crown of

thorns, and building and deploying fish aggregating devices. This underscores the need for programs to recognize the perspectives of and pressures on target information users (Kuiper et al., 2021), and to understand and enhance the choices participant communities feel are available to them.

This may require external partners to share the work of generating new knowledge and action with local communities. In stark contrast to the independence of Philippines dLEM programs, such co-production or interaction with external partners is reported to have empowerment outcomes (Camino et al., 2020; Chambers et al., 2021). Similarly, benefits to communities resulting from changes in attitudes (Becker et al. 2005), trust and improved relations between parties (Quintana et al., 2020), are associated with platforms for multiparty interaction associated with monitoring (Camino et al. 2020). Although greater local control has long occupied the top of the participation hierarchy (Arnstein, 1969; David-Chavez & Gavin, 2018; Shirk et al., 2012) without sufficient agency and opportunity structure, independence can divorce participation from many of its potential benefits.

Steps forward: We recommend, at a minimum, programs engaging locals take the time to fully understand the SES system where they intend to work as external partners, be cognizant of both possible burdens and benefits of participation, and those intending to be sustained independently consider whether benefits are likely to be reproducible locally. LEM and dLEM programs for which cost savings feature prominently (Fox et al., 2017; Theobald et al., 2015) or those without independently reproducible benefits are encouraged to provide sustained, predictable and appropriate remuneration. Programs aiming to support local influence over resource management should consider how participant agency and opportunity structure impact

the likelihood that dLEM will have utility. This means understanding how decisions are made and the role of different forms of information within those processes (Adams & Sandbrook, 2013), understanding the choices local actors feel are available to them (Eicken et al., 2021), and using asset-framing (rather than deficit-framing) to identify appropriate skills to enhance these options (Juma & Khademi-Vidra, 2019; Sterling et al., 2021). If data are not the bottleneck to local influence over decision-making, building capacity in governance, rather than ecological data collection, may better support co-management.

Further, we encourage programs to explicitly reflect on their approaches to reduce the likelihood that they reinforce hierarchies by overlooking or deprioritizing local needs and perspectives. What may be needed to support local empowerment is not more participation (i.e., responsibility), but rather more local influence over research and action trajectories (Reid et al., 2021). As such, we join growing calls for conservation, ecology, and biodiversity research in tropical regions to co-produce research not just with, *but in service to* communities' needs and interests, particularly in marginalized, vulnerable communities (Baker et al., 2019) often hailed as ripe for local participation.

In conclusion, while this case supports previous assertions that dLEM provides local benefits during the periods supported by implementing partners, it also reaffirms cautionary sentiments that LEM is far from a panacea (Shaffer, 2014; Staddon et al., 2015; Turreira-García et al., 2018). Uncritical adoption of “participatory” approaches, without careful consideration of local context (e.g., agency, opportunity structure), can fail to empower, or worse, reinforce the status quo. This case represents an important opportunity to learn from “failure” (Catalano et al., 2019; Shaffer, 2014) and to move beyond assertions of what local monitoring and participatory

forms of research *can* achieve (Bonney, 2021; Danielsen et al., 2021), to evaluate *when and why* desired outcomes arise, or fail to do so (Ferraro & Agrawal, 2021).

## CHAPTER 3: SITUATING DIVERSE AND CONFLICTING RATIONALES FOR ENGAGING LOCAL ACTORS IN SUSTAINABILITY RESEARCH: AN UPDATED TYPOLOGY FOR REFLEXIVITY IN PPSR

### 3.1 INTRODUCTION

Public participation in scientific research (PPSR) is viewed as a favorable approach to simultaneously achieve multiple sustainability objectives, benefiting science and society alike. In this study, we use the umbrella term PPSR (Shirk et al., 2012) to refer to a variety of modalities in which members of the public and professional scientists participate, to differing degrees, in the generation of new information on social-ecological systems. These arrangements are alternately known as community, citizen, or extreme citizen science; local, participatory, or community-based monitoring; and transdisciplinary research and knowledge co-production, among others. There is growing interest in and expectation by agencies and funders to engage members of the public, local communities, impacted stakeholders, and other interested parties in natural resource research and monitoring. Participatory approaches are particularly important given the vital role of local and indigenous communities in stewarding social-ecological systems (Garnett et al., 2018; O'Bryan et al., 2021). PPSR has demonstrated enhancements in financial and human capital for research and action, increased support for science and sustainability initiatives (Jørgensen & Jørgensen, 2020), and provided fulfilling and empowering experiences for participants and local communities (Ballard et al., 2017; Wilson et al., 2018).

The rapid expansion of PPSR- and associated academic interest- has precipitated a proliferation of typologies and taxonomies aimed at describing and improving PPSR's contributions to scientific, sustainability, and social objectives. For instance, typologies have

focused on characterizing participant motivations for joining (Land-Zandstra et al., 2021), scientific variables (Chandler et al., 2017; Theobald et al., 2015), program objectives (Kühn et al., 2022; Pagès et al., 2019; Vallabh et al., 2016), reported outcomes (Stepenuck & Green, 2015; Vallabh et al., 2016), and the degree and quality of participant engagement (Bonney et al., 2009; Danielsen et al., 2008; Shirk et al., 2012).

However, despite expanding PPSR typologies, comparatively little attention has been paid to the rationales for adopting participatory approaches to science (Schmidt et al., 2020; Wesselink et al., 2011), or how organizers' rationales and objectives influence project design, implementation, and outcomes (Riesch et al., 2013; Young et al., 2013), particularly outside of heavily and explicitly co-created efforts. Instead, PPSR projects often articulate why the ecological research undertaken with local participants was needed (Bean et al., 2017), without differentiating between the need to produce knowledge, and the rationales for public *participation* in that knowledge production (see: Brandeis & Carrera Zamanillo 2017; Fraser et al., 2016; Lakeman- Muhamad Khair et al., 2021; Vasiliades et al., 2021). However, the environmental decision-making literature proposes three primary rationales for adopting more participatory approaches. Following the characterization by Fiorino (1990) and others, **normative** rationales are grounded in the principle that those affected should have a say, and aim to strengthen democratic rights and cultures; **Substantive** rationales are based on the understanding that additional inputs (e.g., additional knowledge and values) improve the quality of (social and/or ecological) research outcomes; **Instrumental** rationales relate to enabling research and/or implementation of research-related decisions (Doyle-Capitman et al., 2018; Fiorino, 1990;

Schmidt et al., 2020; Young et al., 2013). In this paper, we understand “rationale” to mean the arguments, or logical basis for a decision or action, which may include objectives.

Unarticulated or ill-defined rationales limit the potential of achieving desired outcomes (Wesselink et al., 2011), including learning (Vallabh et al. 2016) and empowerment of participants (Ebitu et al., 2021). Rationales influence the selection, both implicit and explicit, of participants and modalities of participation (Hauptfeld et al., *in review*; Luyet et al., 2012 ), of which thoughtful selection is crucial for successful engagement (de Vente et al., 2016; Reed, 2008; Reed et al., 2014). Further, lack of clarity can result in divergent and therefore unfulfilled expectations between organizers and participants (Bracken et al., 2015; Wesselink et al., 2011). Therefore, an important step in improving PPSR outcomes, and designing criteria for effective PPSR (e.g., Muhamad Khair et al., 2021) is better understanding the rationale(s) for engaging local participants.

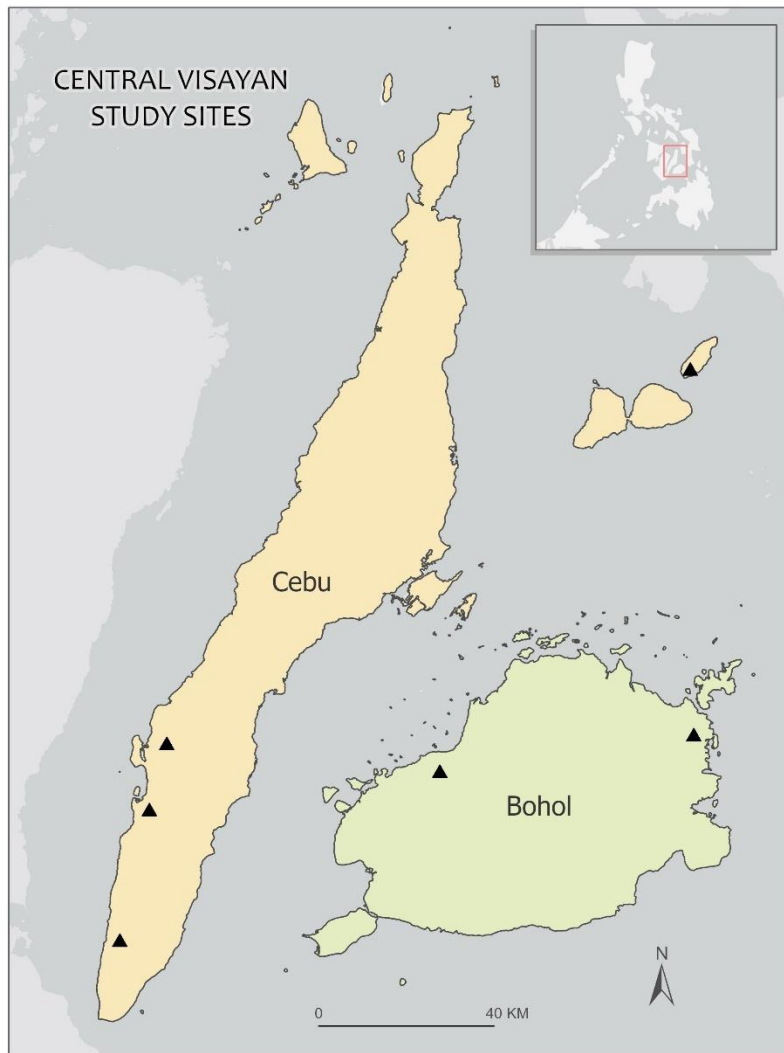
The purpose of this paper is two-fold. First, to facilitate greater reflexivity among PPSR practitioners regarding the underlying rationales for engaging local actors in “delegated” local ecological monitoring projects (Hauptfeld et al., *in review*), by applying empirical findings to existing typologies on rationales. Second, to emphasize the need for a more nuanced discussion of the benefits likely to stem from distinct models of PPSR. To do so, we ask: (i) What rationales do organizers of marine dLEM programs have for engaging local actors in monitoring? (ii) How do these rationales relate to existing typologies on rationales? (iii) How do the rationales, and the conflicts evidenced within them, relate to the proposed benefits from PPSR programs?

### 3.1.2 Background and context

Declining coastal habitat and biodiversity (Cabral & Geronimo, 2018) threatens coastal communities highly dependent on marine resources. Marine protected areas (MPAs) are the primary tool for coastal resource management in the Philippines (Horigue et al., 2012). The devolution of coastal management to municipalities starting in the 1990s<sup>4</sup>, precipitated the establishment of over 1800 small MPAs (MPA Support Network; Weeks et al. 2010) co-managed between Municipalities and a barangay (i.e., village) level organization (e.g., fisherfolk cooperative; Pomeroy & Courtney, 2018). Most comprise small no-take areas (<25 hectares) and were established to support both biodiversity and food security. However, up to 90% of Philippine MPAs have been rated ineffective (Beger et al., 2004; Pomeroy et al., 2005), due partially to inadequate management capacity at local levels ([www.ph.undp.org](http://www.ph.undp.org)). Coastal management in the Central Visayas (Figure 3.1), including MPA designation and management, has been long supported by nonprofit organizations and academic institutions, in part through capacity building (i.e., training) efforts. For the last two decades these efforts have included sporadic, but widespread training of local co-managers in “participatory monitoring” in and around locally managed MPAs (Appendix B). The use of “participatory monitoring” in this paper reflects the usage of the term in the Philippines, and is not meant to suggest a higher degree of community engagement.

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<sup>4</sup>Philippine Local Government Code of 1991 (Republic Act 7160) and Fisheries Code of 1998 (Republic Act 8550)



*Map created by Olivia Doebr, Geospatial Centroid. Source: Esri*

Figure 3.1: Map of Central Visayas region of the Philippines, where the marine dLEM programs implemented by respondents were focused.

### 3.2 METHODS

We chose an inductive qualitative research approach (Yin, 2018) since little is known about rationales of PPSR program organizers for engaging local participants, particularly in developing economies in which community members have roles in natural resource managements. The inductive qualitative approach also allows for the generation of analytical

generalizations which contribute to theory development, rather than statistical generalizations to populations, and an inductive approach accommodates exploration of context-specific factors and individual perceptions (Tzeng & Lipson, 2003; Yin, 2018). This study is part of a larger investigation on the adoption of local ecological monitoring (LEM) in co-managed marine protected areas (MPA) in the Central Visayas region, Philippines, for which the lead author spent 12 months, from January 2017 to August 2018.

### 3.2.1 Information and analyses

This research represents information from 35 key representatives of 13 organizations involved in the design and delivery of participatory marine monitoring training in the Central Visayas over the last two decades. Respondents were Filipino staff and faculty of conservation non-profits, academic institutions, government resource management agencies, and/or international aid programs (henceforth 'organizations'), most holding Master and PhD degrees.

The first author conducted 25 in-person interviews with 19 staff from 7 organizations from March to July 2017, and June to July 2018. Interviews were flexible to allow themes important to the participants to emerge, and a modified grounded theory approach was used to adapt interview guides to incorporate themes expressed by previous participants (Charmaz, 2006). Interviews were conducted in English, an official language of the Philippines, and one of the working languages of the respondents; some elected to interview in pairs. When permission was given, interviews were audio recorded for transcription. Interviews addressed rationales for participatory monitoring, methods and participants chosen; perceptions of the value of marine monitoring; perceived benefits and drawbacks of local participation in monitoring; and factors

they perceived to support or hinder LEM success; and participatory monitoring context, including selection of participant and the nature of participation (see Appendix B).

In addition, 25 representatives of 12 organizations participated in an 8-hour participatory workshop, held in Cebu City, Philippines, in October 2017. During the workshop, participants (i) collectively inventoried and characterized participatory monitoring training efforts occurring between 1997-2017 (focused on the Central Visayas region) (ii) reflected on organizations' rationales and expectations for local monitoring, (iii) co-identified barriers to local adoption of monitoring, and (iv) co-developed recommendations to support programmatic sustainability (Appendix B). The workshop was conducted in English.

### 3.2.3 Data analysis

Interviews were transcribed verbatim by a research assistant, and the first author conducted an adapted inductive thematic analysis (Braun and Clarke, 2019; Clarke & Braun, 2006) of the transcripts. Initial coding was conducted using qualitative data analysis software (MaxQDA Version 20.4.0 and 22.4.1) to develop categorical codes, which were iteratively refined through listing and diagramming (using online platform Miro) to form descriptive and inferential themes from the topics discussed (Braun & Clarke, 2012; Saldana, 2009). Rationales and attributes were drawn from direct responses regarding the logical basis and objectives for engaging local actors in monitoring, as well as respondents' perceptions and reflections on the operational aspects of the program. Workshop worksheets and discussion notes were reviewed for confirmatory and contradictory evidence. We identified themes related to rationales for marine ecological monitoring and engaging local fishers and actors, focusing attention on the prominent antagonism in the rationales identified. As conflicts within the descriptive categories

emerged, we developed latent themes which encompassed the antagonistic spectrums identified between attributes, situating the category *Monitoring sustainability* on a spectrum from “monitoring serves participants” to “participants serve monitoring”. We situated both *Appreciation* and *Management action* categories of rationales on a spectrum in which the objectives for each ranges from “locally determined” to “externally determined”. Responses have been redacted of identifying information to maintain anonymity. The research was approved by and conducted in accordance with ethical standards from Colorado State University (IRB #2920 previously 17-7192H).

### 3.3 RESULTS

#### 3.3.1 Antagonistic rationales and operational procedures

We derived three descriptive categories of rationales: (1) program sustainability, (2) appreciation of resources, and (3) resource management, each supported by prominent descriptive and latent attributes. Notably, we identified disparate and antagonistic meanings in the attributes within each category, as well as between categories. Conflicting rationales were evidenced from respondents within the same organization, and from the individual respondents. Below we focus attention on the attributes, operational aspects, and commonly expressed perspectives which represent the prominent antagonistic relationships in the rationales identified.

#### 3.3.2 Monitoring sustainability

Monitoring sustainability was among the first rationales mentioned for participatory monitoring, supporting the sentiment expressed by one organization staff that sustainability is “the big bandwagon” [270A]. Within this category, we identified two contrasting attributes of

program sustainability: (1) Ensuring the provision of continuous data to partner organizations, and (2) Reducing local reliance on partner organizations (Figure 3.2).

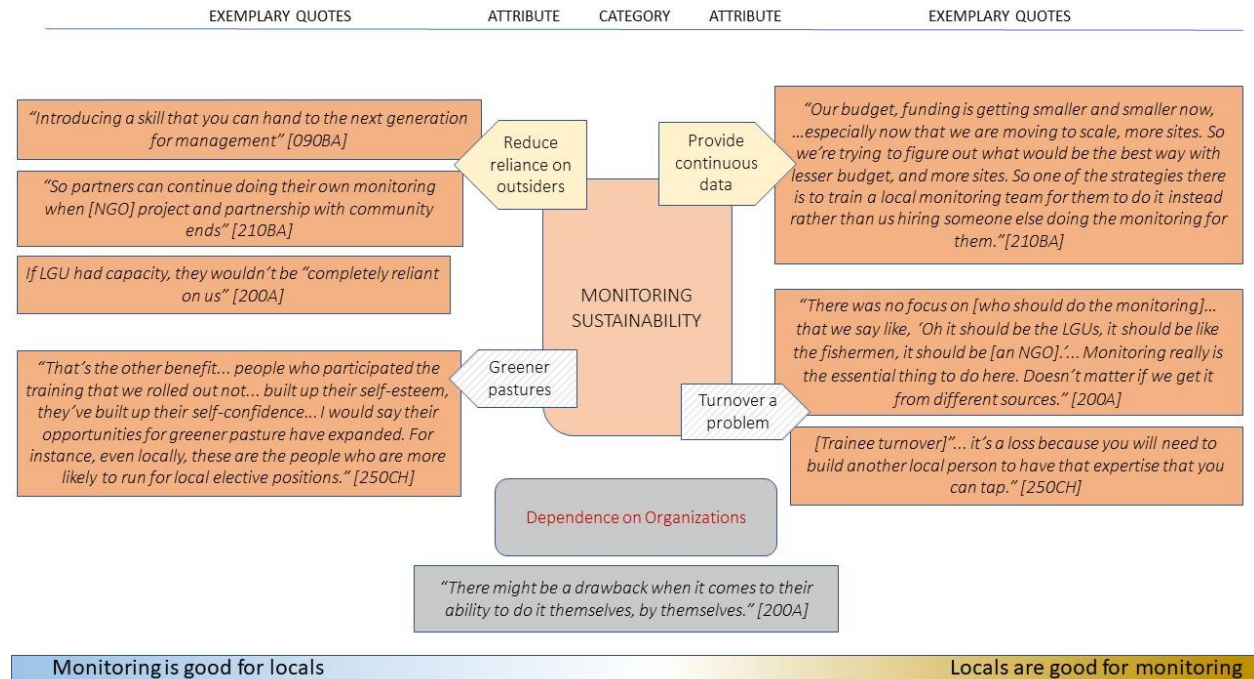


Figure 3.2. Conflicting attributes (yellow arrows) for Monitoring Sustainability rationale category. Direction of arrows indicates antagonisms related to the (latent variable) at the bottom; locations along spectrum are dichotomous for illustration purposes. Hatched arrows represent antagonistic aspects of program operationalization. Grey box (bottom center) indicates perceptions incongruous with both sides of the spectrum.

The first attribute encapsulates a focus on maintaining and enhancing the production of data, either desired by or already being collected by organizations. Local participation is a primary strategy to overcome limited financial and human capital, by providing an alternative to the financially and energetically “unsustainable” option of organizations providing monitoring “for free” [270A]. In this attribute, local participation reduces data collection cost, and limits the number of sites staff need to monitor as programs expand. In this attribute, turnover of local trainees was framed a problem, due to the repeated investment required to train new monitors,

and because new monitors with less experience were anticipated to produce lower quality data, which was destined for use by organizations. Additionally, the persons conducting the monitoring was sometimes explicitly secondary. As one respondent reflected, “it boils down to the people who are there” [270A].

This rationale is supported by the limited choices given monitors (e.g., fishers and local government) and local communities regarding monitoring in the program operationalization, including in the design of methods and indicators. Respondents indicated local communities were not involved in deciding how or what to monitor “because there is a standard” [230] organizations elected to adopt to support collection of “robust” and comparable data [200A]. Instead, organizations opted for standardized monitoring methods and indicators – citing a desire to either maintain continuity with data currently collected by their organization, to be compatible with data collected by others, or “to adopt the standards adopted at the national level”. This attribute represented one extreme of “service” theme summarized as “participants serve monitoring” (Figure 3.2).

The second attribute – reducing local reliance on organizations for monitoring – was mentioned less often, and often in vaguer detail than references to ensuring continuous data. This attribute was characterized by decreasing the reliance of local governments and fisherfolk associations on external organizations. Examples included building capacity to produce information for local purposes and for the benefit of future generations. In contrast to the previous attribute, trainee turnover was framed as benefitting participants – i.e., attaining ‘greener pastures’ [250] through the development of confidence and “marketable” skills, and the pursuit and attainment of better paid and more influence positions like elected office. We

associate this attribute more closely with the “monitoring serves participants” (Figure 3.2) side of the service spectrum.

Interestingly, often respondents’ perspectives on local participants and reflections on program operations conflicted with both an interest in achieving local autonomy, and reliably producing data. Respondents commonly mused that fisherfolk and local governmental staff were dependent upon organizations for long-term support in the collection, analysis, and use of monitoring information, and opined that training was of too short duration to build a sufficient skill base to be independent (Figure 3.2).

### 3.3.3 Appreciation

Building appreciation of marine resources and management among monitoring participants, fisherfolk, and local government staff was a commonly expressed rationale for participation. This category is composed of four attributes (i.e., *Resource awareness*, *MPA Buy-in*, *Change behavior*, and *Empower local actors*).

The attribute *Resource awareness* encapsulates the premise that greater appreciation for marine resources and their decline is needed among local fishers and local government staff, and that to fully “appreciate” resources, greater awareness of them is needed (Figure 3.3). As one respondent expressed, “caring of the resource starts with understanding what they have and what they will lose” [270A]. Resource decline was the primary focus of awareness building, which was principally proposed to occur via direct observation. Direct observation was considered complementary to or better than hearing lessons from organization staff in getting monitors to “come to realize... it’s true what we have been saying... that there’s very less fish already” [240].

Members of the community (i.e., fishers) were also considered better able to spread awareness and convince others to care than staff from the outside organizations.

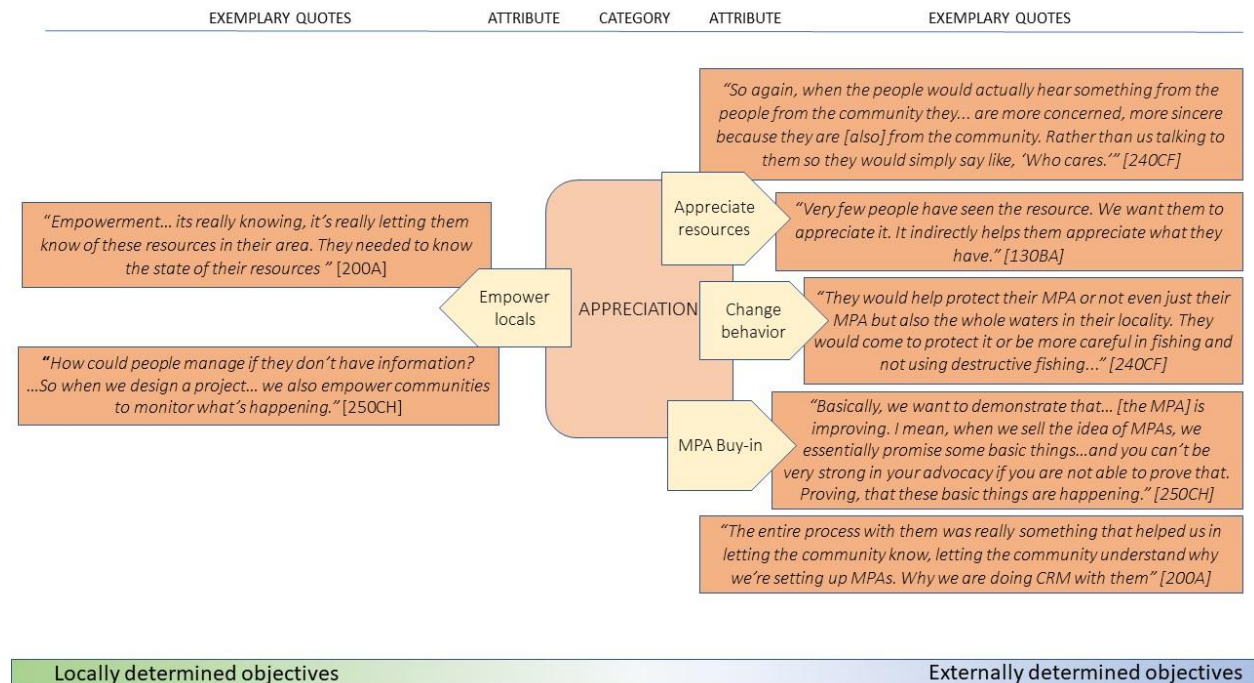


Figure 3.3. Conflicting attributes (yellow arrows) for Appreciation rationale category. Direction of arrows indicates antagonisms related to the (latent variable) at the bottom; locations along spectrum are dichotomous for illustration purposes. Hatched arrows represent antagonistic aspects of program operationalization. Grey box (bottom center) indicates perceptions incongruous with both sides of the spectrum.

Visual observation of the area was also considered by some to be adequate to generate support for MPAs [080 CH]. The next attribute- *MPA Buy-in*, reflects the idea that greater awareness and appreciation of resources leads to more local support – financially, personally, and politically – for MPAs and for resource protection (Figure 3.3). Organization staff were of the mindset that participation in monitoring helps both fishers and municipal staff recognize the need for resource management and monitoring, and dedicate resources to it. Further, participation was seen as means to demonstrate to local actors the need for MPAs; that better protected MPAs (potentially at other sites) have more fish; that the local MPA is performing as

promised by the organizations during its establishment; and “that the [local] efforts invested in [MPA] enforcements are working” [200A].

A third attribute – *Behavior change*, encapsulates references to building awareness for the purposes of changing the behavior of participants (primarily fisherfolk) and their communities (Figure 3.3). Target behaviors primarily related to reducing illegal fishing in MPAs. Respondents suggested that participation was a means to inspire fisherfolk to use less destructive fishing practices, and motivate guards and municipal officials to more strictly implement and enforce MPA regulations. Others anticipated that fisherfolk would act as messengers, and “deliver the message ‘we need to stop illegal fishing in our area’” [240] to their communities. The scope of behavior change rationales primarily applied to marine protected areas, and sometimes to coastal areas beyond MPA boundaries. Together, the three attributes above represented one extreme of the latent theme on objective setting: “externally determined objectives”.

The final attribute related to awareness and appreciation of resources, – *Empowerment*, comprises the few and vague references to participation in marine monitoring- and the resulting opportunities to generate and access information- as intended for purposes determined by local officials and communities (Figure 3.3). This includes explicit references to “empower[ing]” [200A; 250] participant communities, and references to building awareness of local officials and communities, without concomitantly referencing an externally determined objective (e.g., to convince participants fish are declining, MPAs are working, or MPAs should be more strictly enforced). The last attribute in Appreciation represented the other extreme of the latent theme on objective setting: “locally determined objectives”.

### 3.3.4 Management action

The final rationale category relates specifically to the mechanism by which participatory monitoring is proposed to support resource management and decision-making. This category was composed of two attributes, *Help us help you* and *Local control*, each representing a different “side” of the objective-setting spectrum (Figure 3.4) The former represented the “externally determined objectives” end of the objective setting theme, while we aligned the attribute *Local control* with the “locally determined objectives” (Figure 3.4).

The first attribute- *Help us help you*, encapsulates the perspective that local monitoring supports resource decision-making by providing key information to organizations, who in turn document and address the issues, to the perceived benefit of the local communities. This attribute includes both explicit and implied references to assisting local parties with coastal resource management. For instance, respondents indicated that a good application of local monitoring would be an early warning system for coral bleaching, in which local monitors could report observations to provincial authorities or NGO partners for further action. This attribute is supported by the limited choice afforded participants and local communities to influence monitoring (as mentioned above).

In contrast, the attribute- *Local control*, encompasses expressions of participation in monitoring as a support for local rights and control. Control included decision-making regarding natural resources, well as regarding (portions of) the monitoring process, such as identifying criteria for participant selection (Figure 3.4). These include references to supporting local participation as a matter of principle, as well as any reference to supporting local decision-making in which partner-determined objectives or anticipated data use was absent. This rationale rests upon a perspective

that data generated locally by fishers or municipal staff, and/or resulting from approaches modified for local users, are suitable for identifying trends and decision-making.

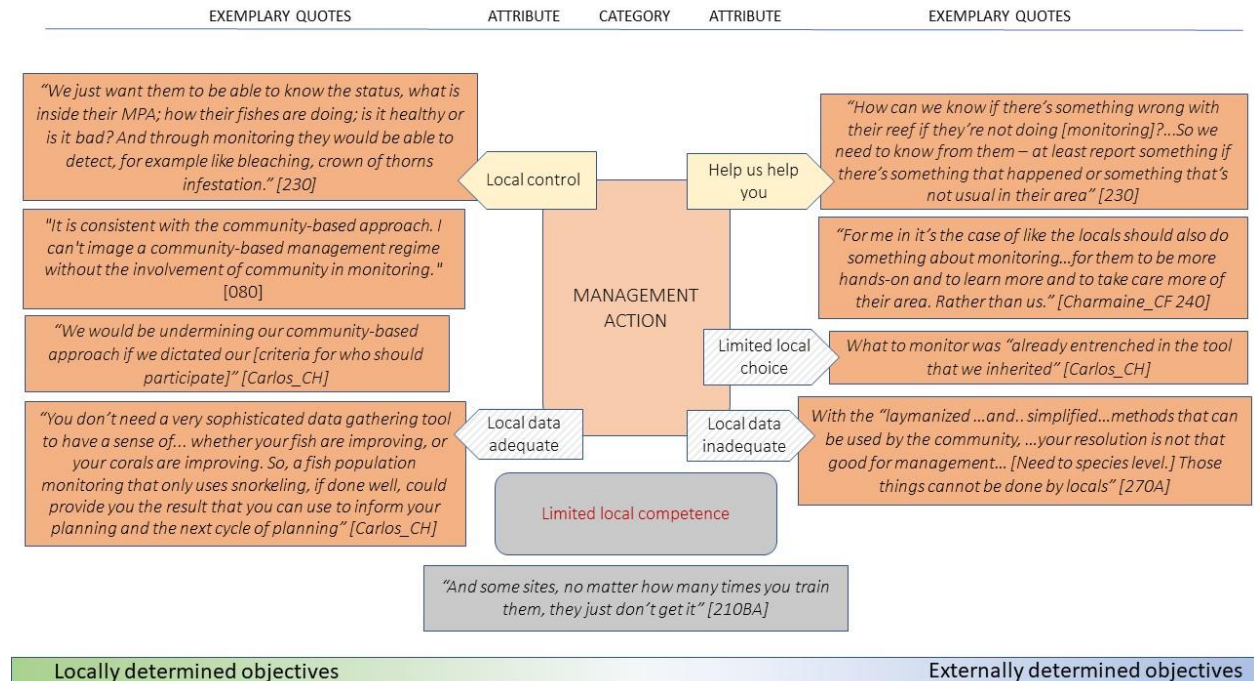


Figure 3.4. Conflicting attributes (yellow arrows) for Management Action rationale category. Direction of arrows indicates antagonisms related to the (latent variable) at the bottom; locations along spectrum are dichotomous for illustration purposes. Hatched arrows represent antagonistic aspects of program operationalization. Grey box (bottom center) indicates perceptions incongruous with both sides of the spectrum.

However, both management action attributes above (i.e., participatory monitoring as a means to facilitate local control, and as a means to inform NGOs decision-making and action) were contradicted by common perceptions that local data were inadequate for use in decision-making, both locally and generally. Perspectives that “the community has limitations” due to the “level of their literacy” [240] (e.g., some fishers having an elementary school education) or non-fisheries background of local governmental staff (e.g., holding degrees in terrestrial rather than marine sciences), supported perceptions of poor accuracy, reliability, and resolution of data.

Limited perceived competency of fisherfolk, combined with the common reflection that training was of too limited duration and frequency to adequately train participants (e.g., “it takes years” [270]), led to methodological adjustments (e.g., fewer transects, no comparison outside the MPA, observation only) [130]. Such adjustments were also cited as reasons that local data was not useful. Further, respondents within the same organization(s) expressed conflicting sentiments regarding the adequacy of data collected by participants.

### 3.4 DISCUSSION

Our results highlight that rationales for local participation in ecological monitoring can be multiple, diverse, and most notably, antagonistic. In part, these antagonisms existed between overtly expressed rationales and those revealed through organizers’ reflections about participants and other aspects of the programs. For instance, although organizers’ intent to foster awareness and environmental stewardship within local communities seemingly aligned with a desire to support management, the operationalization of these aspects presented conflicts. Whereas building public awareness and ability to adopt desired changes would have benefitted from widespread public participation (Sauermaun et al., 2020) and exposure, achieving the data rigor perceived necessary for management dictated maintaining small, well-trained groups, with minimal trainee turnover. Similarly, because large-scale studies without locally salient data can disempower local stakeholders (Ebitu et al., 2021), organizers’ commitment to standardized data and methods for the purpose of scalability and comparability conflicted with the desire to empower participants and their communities with monitoring program designs. Research in related fields, including science, collaborative resource management, and transdisciplinary research, similarly report diverse, ill-defined, and potentially conflicting objectives (Kovaka, 2021;

Kretser et al., 2018; Sauermann et al., 2020; Vallabh et al., 2016)(Kovaka, 2021; Kretser et al., 2018; Sauermann et al., 2020; Vallabh et al., 2016), reducing program efficacy and the ability to achieve “win-win” outcomes (Chambers et al., 2022; Kovaka, 2021). Similarly, the antagonisms between rationales we identified here likely contributed to the unsuccessful efforts to empower communities to conduct local ecological monitoring programs in community co-managed marine protected areas in the Philippines, and their inability to sustain over time (Hauptfeld et al., *in review*).

Further, conflicting rationales were evidenced across sectors, within organizations, and sometimes from the same individual, suggesting that organizers may have been unaware of the potential tensions between rationales. This reflects, in part, the win-win narrative in PPSR in conservation, which also emphasizes both a “productivity” view where high quality, fine spatial scale data is “paramount” (Friedman et al., 2020; Fritz et al., 2019), while also adopting “democratizing” rhetoric (Oesterle et al., 2019; Sauermann et al., 2020; Woolley et al., 2016). The win-win narrative also permeates *contributory* projects, the most common (Land-Zandstra et al. 2021), and least participatory form of PPSR (Bonney et al., 2009; Shirk et al., 2012). Although PPSR is widely acknowledged to span various degrees and quality of participation, each with different potentials to foster individual and societal benefits, these distinctions in design are often overlooked when invoking the potential for societal benefits alongside contributions to science.

The rationale categories we identified (i.e., awareness and appreciation, management action, and monitoring sustainability) correspond, to a large extent, to categories common in PPSR typologies and frameworks related to rationales (e.g., those addressing objectives, virtues,

benefits, outcomes), for example, variations on *education, management, and research*, respectively (see: Lakeman-Fraser et al., 2016; Kapos et al., 2008; Wiggins & Crowston 2011) (Figure 3.5).

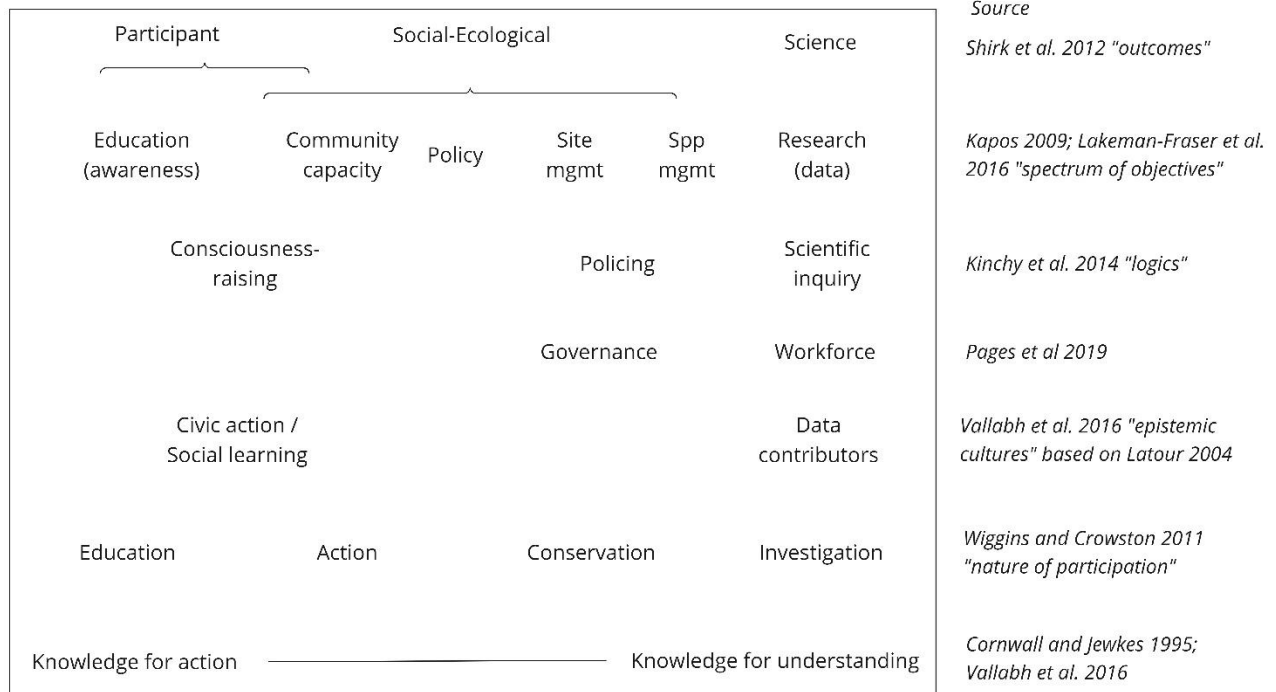


Figure 3.5. Comparison of PPSR typologies related to rationales, with the unifying concept “science” at one extreme (right side). Typologies progress (top to bottom) from a conceptualization of the individual (i.e., participant) as the other extreme, to action as the other extreme, demonstrating an implicit association of education / action as “benefits” to the individual participant.

However, our research indicates that generic categories can obscure important contrasts in underlying rationales, particularly regarding *who is perceived to be served* by PPSR (i.e., ‘participants serve monitoring’ v ‘monitoring serves participants’) and *who has influence* over the agenda (i.e., ‘locally determined’ v ‘externally determined’ objectives) (Figure 3.6). For instance, while domains related to education and capacity are commonly framed as benefitting participants and society, the rationales we found associated with learning and awareness-

building often reflected NGO priorities, including marketing conservation interventions (Woolley et al., 2016) and conservation behaviors to local communities. This suggests that truly achieving benefits from participation may be improved by considering more than one dimension – i.e., acknowledging both who is perceived to benefit, and who determines what constitutes benefit (Figure 3.6).

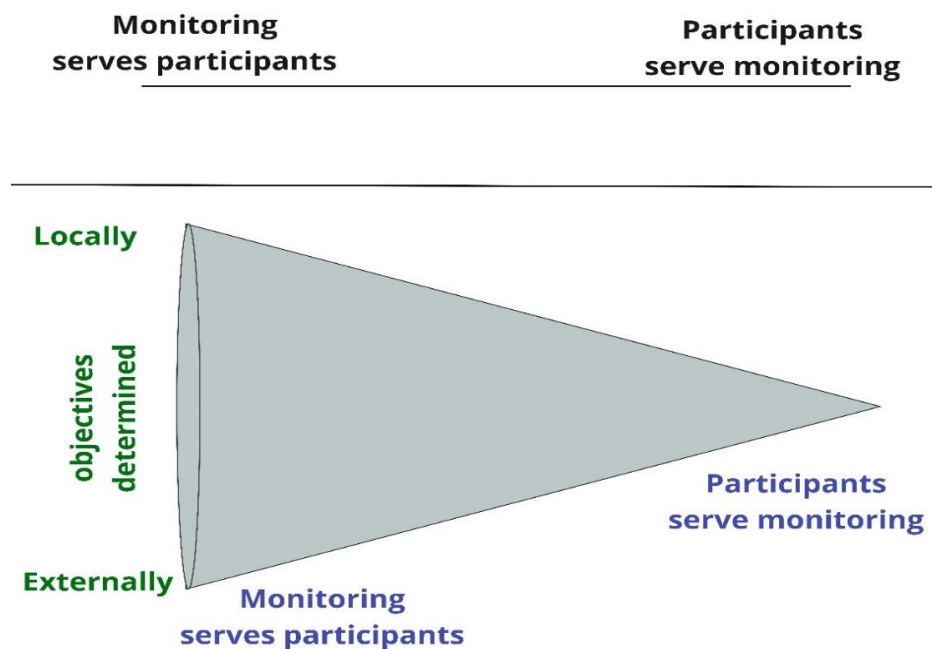


Figure 3.6. Dichotomous approach to identifying who benefits from PPSR (top); Expanding the understanding of “benefits” to participants by integrating 2 axes: ‘Who is served’ (lower axis) with ‘Who sets the agenda’ (bottom).

### 3.4.1 An adapted typology for reflexivity

Reflexivity, a critical component in efforts to co-produce knowledge (Chambers et al., 2022; Cockburn et al., 2020; Steger et al., 2020), is warranted in PPSR (Vallabh et al., 2016) at collaborative and contributory levels. Because motivations for efforts to conduct science with the public heavily shape them (Chambers et al., 2021), overlooking the questions of who sets the

agenda (i.e., who determines the objectives) and is served by participation (e.g., whether research, management, education, and/ or action agendas are determined and implemented by and for local or distal actors and interests) impairs the ability of programs to design for desired outcomes, and of the academic community to accurately assess PPSR’s transformative potential.

To encourage and facilitate reflexivity in PPSR, we integrate an established typology of rationales for engaging the public from the political decision-making literature, recently applied to PPSR (Schmidt et al., 2020) (Figure 3.7). Fiorino’s (1990) division of rationales into normative, substantive, and instrumental arguments largely reflect our results, as well as assertions and critiques in the PPSR literature. However, by adding dimensionality to the typology, grounded in PPSR practice, we enhance its functionality for reflexivity in PPSR.

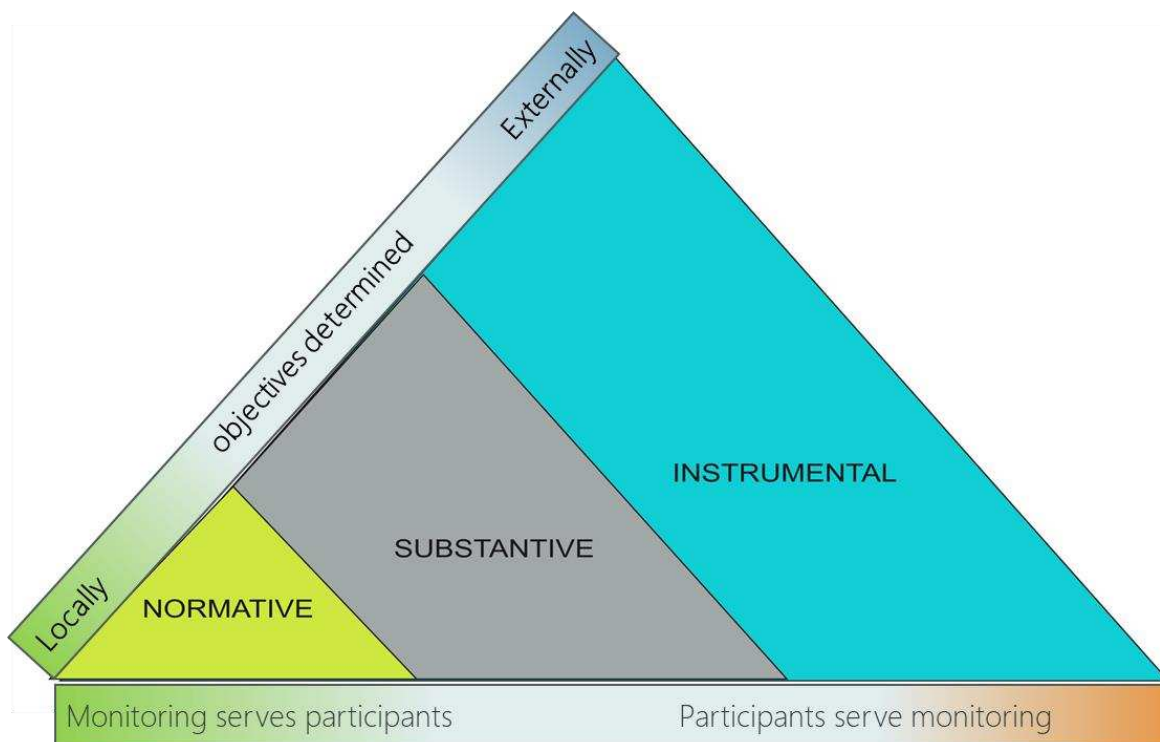


Figure 3.7. Conceptual model of Fiorino’s (1990) typology of rationales for engaging participants adapted to fit within the with the latent themes we identified along two axes: ‘Who is perceived to be served’ (lower axis) with ‘who sets the agenda’ (left axis).

Similar to Schmidt et al. (2020), we found that instrumental rationales dominated. Echoing critiques regarding who is served by monitoring (e.g., Hauptfeld et al. *in review*; Pagès et al., 2019; Turreira-García et al., 2018) we consider rationales in which participation was intended to produce data for use by external parties as instrumental. In addition, reflecting the concern over who determines the terms of participation activities and objective of participation outputs (e.g., capacity) (e.g., Brodie et al., 2009; Pettibone et al., 2018; Rautio et al., 2022; White, 1996)(Brodie et al., 2009; Pettibone et al., 2018; Rautio et al., 2022; S. C. White, 1996), we consider rationales regarding management and awareness, often considered to serve local communities, as instrumental when the objectives were driven by the priorities of the external organizations, rather than local actors. Rationales in which participation and/or data were envisaged to serve participant communities through means determined by local actors as normative. Despite the normative rhetoric common in PPSR, including among *contributory* projects, normative rationales were infrequent, a finding echoed by Schmidt et al., (2020). To the substantive rationales in which participation improves research, we add rationales intended to substantively contribute to objectives which serve both local and external actors, such as awareness and management activities. Contrary to substantive rationales common in the co-production literature, we documented few substantive rationales in these *delegated* contributory projects. This could be a function of limited staff capacity to adjust methods in response to potential inputs, or a reflection of scientific elitism limiting interest in releasing power and allowing seeking participant inputs (Schmidt et al., 2020). Future research may wish to investigate how rationales differ among different types of PPSR (e.g., contributory, collaborative, co-created) and how these variations affect outcomes.

We believe that the dimensionality provided by the added axes enhances functionality to the traditional rationale typology, increasing utility for reflection among PPSR practitioners, particularly in contributory. In addition, we believe explicit acknowledgement of whether participation, and the outputs of participation, are meant to be substantive, normative, or instrumental in nature, is an important step towards designing and assessing win-win benefits. Our intention is not to affix value judgments to different levels of participation in PPSR programs, nor between rationales. Contributory programs, which prioritize data collection and with largely instrumental rationales, make important contributions to conservation goals (Friedman et al., 2020; Fritz et al., 2019), and can result in individual and societal benefits. However, we believe it is important to systematically acknowledge that not all programs produce, nor are intended to produce equal benefits, and hence to explore the nuance of both rationales and outcomes.

In conclusion, explicit and honest reflexivity by the program organizers in the Philippines regarding their underlying rationales for designing and adapting ecological monitoring for local participation could have increased the success of their programs- increasing sustainability of monitoring, application to management, and empowerment of participants and communities (Hauptfeld et al., *in review*). As a baseline for reflection, considering who is served by monitoring, and who sets the objectives can allow program organizers to assess whether their operations and perceptions regarding local actors support normative rationales, for instance. However, to guide appropriate adjustments or additions to programs, reflexivity at the program level must be supported by a shift in the field of PPSR, away from optimistic assertions of transformative effects of participation based on assumptions (Bela et al., 2016) to realistic recognition of the potential at differing degrees, and a nuanced exploration on how to support opposing objectives.

CHAPTER 4: BUILDING CAPACITY FOR INDIVIDUAL AND SYSTEMS-LEVEL COLLABORATIVE  
CONSERVATION IMPACTS: INTENTIONAL DESIGN FOR TRANSFORMATIVE PRACTICE<sup>5</sup>

4.1 INTRODUCTION

Addressing the complexity and uncertainty that typify sustainability questions while achieving social and ecological benefits requires integration across sectors and disciplines, as well as with stakeholders and local actors (Marvier & Kareiva, 2014; Rai et al., 2021; Steger et al., 2020). Multi-party and community-engaged approaches to social-ecological systems governance, management, and research provide avenues for meaningful integration of diverse user values and perspectives, enriching decision-making inputs and enhancing local influence over the direction and pace of change (Fernández-Giménez et al., 2019; Sterling et al., 2017; Stringer et al., 2006). Greater community ownership of processes and outputs increases the likelihood that decisions will produce enduring, culturally and ecologically appropriate impacts (Berkes, 2010; Mulrennan et al., 2012). We define such community-oriented “*collaborative conservation*” as formal or informal coordination of processes, including exploration, prioritization, implementation, and evaluation of actions, which bring together stakeholders who may hold diverse or adversarial knowledge and views, to address sustainability challenges in a manner that seeks to equalize power dynamics and benefit affected local actors (adapted from Ansell & Gash 2008; Cockburn et al., 2020; Feist et al., 2020; Thomas & Mendezona Allegretti, 2020).

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<sup>5</sup> This chapter was published in *Society & Natural Resources* with co-authors Megan S. Jones and Kim Skyelander.

As collaborative approaches to conservation have increased in recent decades (Conley and Moote 2001) collaborative capacity has become a priority for conservation professionals (Elliott et al., 2018; Englefield et al., 2019), although training on collaboration with communities remains less common than between agencies (Bruyere et al., 2020). Capacity building can boost conservationists' adoption of new skills and desired approaches (Bruyere et al., 2021; Sawrey et al., 2019), including greater openness to involving local people in management (Scholte et al., 2006). *Capacity building* captures the process by which individuals and communities transform their mindset and attitudes, and enhance the knowledge, skills, resources and systems needed to perform functions, solve problems, and achieve objectives (OECD, 2006; United Nations, *n.d.*). Despite calls to better understand program effectiveness and utility (Newcomer et al., 2015), evaluation of capacity building programs remains uncommon, especially in conservation (but see: Ries, 2019; Sawrey et al., 2019). Evaluation of capacity building in strongly interpersonal fields such as collaborative conservation is therefore needed.

The wider conservation capacity development community would also benefit from illuminating the “black box” of pathways supporting adoption of new approaches (Sterling et al., 2022). To address these needs, we conducted one of the first evaluations of inputs and long-term impacts of collaborative conservation capacity building for academics and practitioners. We explore the Center for Collaborative Conservation’s ongoing fellowship, which aims to create collaborative conservationists while simultaneously contributing to social and ecological benefits for stakeholders. Reflecting the program’s desire to improve, our research had two main objectives:

1. To determine the fellowship’s impacts (i) on participants, particularly their long-term individual willingness and ability to adopt a collaborative orientation and practice, and (ii) through fellows individual funded projects;
2. To understand the influence of the different fellowship inputs on the perceived impacts to the fellows and their projects, and whether these varied between fellows of different disciplines and professional roles.

We briefly introduce the study program, then present a unified, empirically based causal model of long-term individual-level changes in collaborative practice, highlighting intermediary dimensions of capacity which were key to adopting collaborative approaches, and the programmatic inputs which supported these changes (Figure 4.1). We then explore fellows' evaluation of social and ecological outcomes in their individual projects, and end by suggesting ways to enhance balanced individual- and systems-level impact.

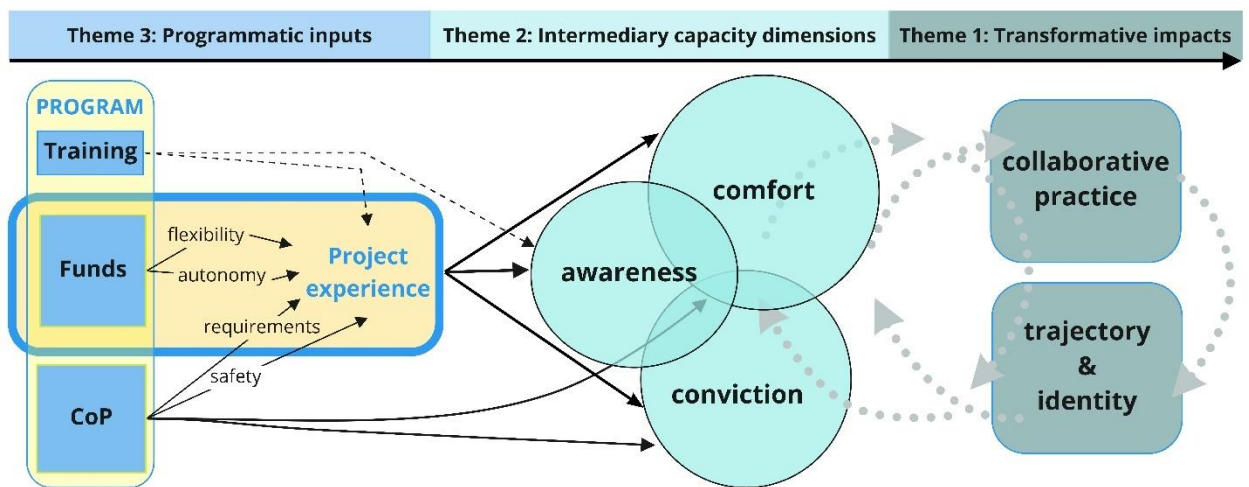


Figure 4.1. Empirically-based causal model of individual-level collaborative conservation capacity and practice. Important programmatic inputs (left side, Theme 3) are the project experience, flexible funding, and a safe community of practice (CoP) which expects new approaches. Multiple dimensions of capacity (Theme 2) support long-term collaborative practice, and new professional identity and trajectory (Theme 1). Dotted “spiral” represents reinforcing relationship between practice and comfort, conviction, and awareness.

#### 4.1.1 Center for Collaborative Conservation Fellows Program

Established in 2008, the Center for Collaborative Conservation (CCC) in the United States is one of few programs dedicated specifically to building collaborative conservation capacity. In 2009 the CCC initiated its ongoing flagship program, the Fellows Program, to “create the ‘new conservationist’ who is passionate about using a collaborative approach to bring together different knowledge systems to create solutions to today’s complex conservation issues” ([www.collaborativeconservation.org](http://www.collaborativeconservation.org)). Although no explicit Theory of Change existed at the time of this research, print and online programmatic materials from the first 10 years listed various goals, anticipated impacts, and associated pathways (Appendix C). We summarize these as: The Fellows Program aims to enhance benefits to both conservation and communities by expanding the use of people-centred approaches across diverse boundaries to spur innovation, local relevance, and local capacity.

The fellowship includes four main structured components: (1) a training retreat, (2) an applied 18-month collaborative conservation project with (3) financial support; and (4) periodic cohort-wide meetings. Projects receive from \$5000-15000 and can address any issue or system, provided they (i) be collaborative (i.e., engage at least one local partner in project scoping, design, and/or implementation) or study the process of collaboration; and (ii) address both conservation and livelihood<sup>6</sup> components. All fellows (except Cohort 1) were required to attend a 3-day training retreat at the start of the fellowship (Appendix C and Table C.1 for program details).

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<sup>6</sup> The program used ‘livelihoods’ to encompass social outcomes including well-being, entrepreneurial development, education, gender equity, and cultural knowledge transmission.

In its first 10 years, fellows engaged with diverse collaborators (e.g., community members, private landowners and businesses, universities, non-profits, and Tribal, federal, and state representatives) in 96 mostly unrelated projects in 12 U.S. states, 17 Native American Nations, and 26 (primarily developing) countries. Although the fellowship did not collect systematic data on fellows' age, disciplinary training, country of origin, ethnicity, or other identifiers, program documents indicate that fellows from diverse disciplinary backgrounds and interests (e.g., conservation biology, human dimensions of natural resources, political science, rangeland management, sociology) sought to better understand and/or address myriad challenges (e.g., climate change impacts, food security, forest restoration, human-wildlife conflicts, protected area management, species conservation, threats to Indigenous sovereignty, water issues) in coastal, desert, forest, mountain, rangeland, agricultural and urban environments. For a complete list of project titles and locations, see Skyelander et al., (2019).

## 4.2 METHODS

### 4.2.1 Study Population

By 2019, the fellowship had graduated 104 fellows (64% women; 36% men) in eight cohorts (9-18 per cohort) representing 3 fellow types: Colorado State University faculty (including extension staff and post-doctoral researchers; n=20) and graduate students (master's and doctoral; n=55), and community practitioners (who manage natural resources privately, or in agencies, Tribal nations, NGOs, etc.; n=29). We limited participation to alumni who had completed the program between 2010-2017 (i.e., Cohorts 1-8) to understand longer-term impacts (2-10 years). Due to the small alumni population, all eligible alumni with valid emails (92, excluding the lead author) were invited to participate and forty-seven responded to >50% of the

survey questions and were retained (51% response rate) (see Tables C.2a-d) for respondent characteristics). Thirty of the forty fellows indicating interest in an interview (34% of eligible alumni) were purposively selected to represent all eligible cohorts and fellow types. Interviews suggested that most or all interview respondents had also participated in the survey. Informed consent was solicited prior to participation.

#### 4.2.2 Survey and Interview Design and Administration

We used mixed methods combining a survey and interviews (Creswell & Clark, 2018) to explore participants' perceptions of the program. A survey using multiple choice and 5-point Likert items evaluated alumni perspectives of program impacts (identified *a priori* from programmatic documents), relative influence of programmatic components, and respondent characteristics (fellow type, etc). The survey was piloted with the active year cohort and administered online through Qualtrics from May-August 2019. Recruitment emails included an incentive to win a randomly assigned \$20 gift card.

Semi-structured interviews yielded a more comprehensive understanding of causal processes (i.e., what worked and why) and unanticipated impacts (Kelle, 2006). In person and virtual interviews were conducted by the first and second authors from June-August 2019. Interview questions addressed fellowship impacts on participants, including changes in fellows' ability and willingness to collaborate and the nature of collaboration; the fellowship components to which fellows ascribed change; the perceived impacts of fellows' funded projects; and recommendations for program improvements. Questions were provided prior to interviews, which were recorded and lasted 30-60 minutes (see Appendix C for survey and interview guide).

#### 4.2.3 Data analysis

Quantitative analyses were conducted using IBM SPSS software (Version 27.0). Descriptive statistics were run on all data to identify impacts and fellowship inputs driving these impacts. Shapiro-Wilk's test indicated non-normal distribution of responses, so we assessed the influence of different programmatic inputs among fellows for whom the program was valuable using non-parametric Wilcoxon Signed Rank Median tests on paired Likert questions, and parametric T-tests on calculated means of grouped Likert items. To assess whether a unified empirically based causal model was justified we tested for differences in perceptions between fellow types and disciplines (i.e., the survey asked whether respondents identified with the 'natural sciences (e.g., wildlife biology, ecology, biodiversity conservation)', 'social sciences (anthropology, human dimensions, livelihoods)', or 'both equally' (which we term 'cross-disciplinary' in this paper)) using ANOVA and corresponding non-parametric Independent Samples Kruskal-Wallis tests followed by Mann-Whitney post hoc tests.

The first and second authors conducted thematic analysis of interview transcripts and notes (Braun et al., 2019). Code development began during the interview process. The first author conducted the initial coding of all interviews to develop a set of open codes in RQDA (R package version 0.3-1). The two authors then iteratively refined codes, listing and diagramming codes to triangulate meaningful descriptive themes (Clarke & Braun, 2006), through the writing process and after a focus group with alumni during the program's 10-year reunion. Quotes could support multiple themes. We present the predominant narratives related to the fellowship's impacts and the pathways supporting those changes. Quotes have been redacted of identifiable information.

### 4.3 RESULTS

Ninety-six percent of survey respondents found the fellowship professionally useful, and greater than three quarters agreed that eight of the 10 career impacts we inquired about resulted from participation (Themes 1-3 and Figure C.1). We organize results into four themes, which build on one another (Figure 4.1). Interviews revealed substantial, and sometimes transformative, changes in fellows' individual practice and professional trajectory (Theme 1), supported by development of intermediary dimensions of capacity, characterized by increased awareness of, comfort with, and conviction toward community-engaged collaborative approaches (Theme 2). Project experience, flexible funding and the fellowship community were the most meaningful fellowship inputs (Theme 3). Theme 4 highlights that fellows' funded projects often evolved and were continued, and that fellows perceived social, but not ecological benefits resulted from their projects. Quantitative analyses are presented in Table 4.1 and Tables C.4 - C.6; Supporting quotes are presented in Table 4.2 and Table C.3.

Table 4.1. Comparative influence of (i) fellowship projects and Fellows Program (broadly) on individual career changes (columns 1-2); and (ii) Fellows Program on long-term (career) versus short-term (fellowship project) changes (columns 2-3). Responses measured on a scale of 1 (strongly disagree) to 5 (strongly agree). (\*) Wilcoxon signed ranked medians were significantly higher for projects than for the Fellows Program ( $T=30$ ,  $z=-3.27$   $p=.001$ ); and (\*\*) for fellows' careers than fellows' projects ( $T=46$ ,  $z=-1.23$   $p=.017$ ). (†) Kruskal-Wallis 1-way ANOVA with Mann Whitney U tests indicated significant differences among *fellow disciplines* (†), with natural science fellows less likely to agree (Appendix C).

	My experience in my fellowship project...				My participation in the Fellows Program...				My participation in the Fellows Program...			
	n	Agree	Mean	SD	n	Agree	Mean	SD	n	Agree	Mean	SD
Has been useful to me professionally	45	95.6%	4.56	0.76	47	85.1%	4.47	0.75				
Provided insights that I have used frequently...*	46	91.3%	4.43*	0.86	47	76.6%	4.02*	0.94				
Increased the degree of collaboration...	46	82.6%	4.24	0.92	47	78.7%	4.17	0.89	44	79.5%	4.11	0.92
Improved my ability to work with a diversity of people...**	46	80.4%	4.24	0.90	47	80.9%	4.17**	0.92	42	73.8%	3.93**	0.84
Improved my ability to meet the needs of communities where I work...	46	84.8%	4.13	0.98	47	70.2%	3.94 <sup>†</sup>	1.03	44	70.4%	3.95	0.89
Strengthened my leadership...	46	82.6%	4.11	0.82	47	74.5%	3.96	0.93	42	67.7%	3.93	0.92
Made me more innovative...	46	82.6%	4.11	0.92	47	72.3%	3.91	0.97	42	68.2%	3.98	0.90
Increased how much I integrate livelihood considerations...	44	75.0%	4.07	0.95	45	68.9%	3.87	0.94	43	58.1%	3.81	0.93
Provided a network that I have benefitted from...	45	66.7%	3.93 <sup>†</sup>	1.05	47	61.7%	3.83 <sup>†</sup>	1.03	43	55.8%	3.67 <sup>†</sup>	1.15
Increased how much I integrate conservation considerations...	45	60.0%	3.76 <sup>†</sup>	0.91	45	62.2%	3.69 <sup>†</sup>	0.93	43	59.1%	3.73	0.90
Mean individual impact	46	n/a	4.16	0.69	47	n/a	4.00	0.71	44	n/a	3.89	0.66
	...in my career				...in my career				...in my fellowship project			

Table 4.2. Illustrative quotes supporting Themes 1, 2 and 3.

	Sub-theme(s)	Illustrative quote
Theme 1: Transformed practice	New trajectories	“Participatory methods involving local people as collaborative researchers... has become my specialty... It changed my life, and my research direction.” (Fellow 7, graduate student)
	Enhanced practice	“I’m more willing to be a leader. Before I was a CCC fellow... I preferred someone else to be the lead of [collaboration]. But through the fellowship... I began to feel more comfortable speaking out and saying, ‘I think this is the way this needs to go and here’s why.’” (Fellow 14, faculty)
Theme 2: Intermediary capacity dimensions	Awareness	“The [training] retreat helped me see that there is pedagogy and evidence-based best practices for effective collaboration. And that was new to me, because I thought ‘well you just collaborate with people.’” (Fellow 19, faculty)
	Comfort	“It definitely impacted me in terms of leadership. I think of leaders as people who kind of have a burden of responsibility to make decisions... and so when you have to make decisions, you have to have information available based on a big picture perspective, which is something the CCC project helped you do...in collaboration with other people.” (Fellow 1, graduate student)
	Conviction	“Going through the fellowship got me on the right track, thinking about these tougher and more interesting and impactful questions about how to really engage communities in conservation work... and not just a researcher-subject sort of arrangement.” (Fellow 6, graduate student)
Theme 3: Key program inputs	Experiential project	“It really got hammered home [during my project] how some of what I was asking was on the right track, but other things that were emerging were so much more relevant to them.” (Fellow 15, graduate student)
	Flexible funding	“It was SO good to have...funding for [stakeholder] participation. The CCC allowed me to feed people, and that is in the literature. It’s such a huge part of collaboration. How do you get people to the table?... You have to feed people.” (Fellow 8, graduate student)
	Community of practice	“I...felt like I was a part of something... I think that being part of the cohort gave me that confidence.” (Fellow 26, graduate student)

#### 4.3.1 Theme 1: Changes in Fellows’ Professional Practice and Trajectory

“I definitely think it changed the way I do things.” (Fellow 18, practitioner)

Survey respondents attributed gaining insights they used frequently (91%) and increasing integration of both collaboration (83%) and livelihood considerations (75%) in their work post-fellowship to the fellowship (Table 4.1).

Although not all fellows shared changes in behavior during interviews, all fellow types (i.e., graduate students, faculty, and practitioners) described collaborating more frequently, deeply, intentionally and across more sectoral, disciplinary and cultural boundaries; and facilitating greater stakeholder involvement in and influence over their work.

Fellows across types reported profound, even “transformative” (Fellow 15, graduate student) influence on their professional identities, laying a “foundation” (Fellows 5 & 26, graduate students) for their subsequent trajectories. These fellows credited the fellowship experience with their increased interdisciplinarity and subsequent positions and areas of expertise, including an explicit focus on collaborative methods, seeking out partnership-based work, and integrating social and natural sciences (Table 4.2). New trajectories were accompanied by reorientations of interests and the development of an identity in a new field, as an expert, or as a more ethical researcher and collaborator. Conversely, fellows reported some barriers to pursuing and practicing collaboration in their post-fellowship careers, which included limited control over decisions, cultural differences in subsequent organizations and countries of employ, as well as shifts in fellows’ focus (e.g., to publishing, rather than conducting, research).

#### 4.3.2 Theme 2: Intermediary Capacity Dimensions

Survey respondents perceived the fellowship improved their ability to work with a diversity of people (80%) and meet the needs of communities where they work (85%). Kruskal-Wallis test indicated no differences between graduate student, faculty or practitioner fellows; however, social science and cross-disciplinary fellows found the Fellows Program (not including fellowship projects) improved their ability to meet communities’ needs more than natural science fellows did ( $H(2)=9.27, p=.010$ ).

Interviews indicated that participation inspired and “reinforced a willingness and an ability [to collaborate] that was already there” (Fellow 24, faculty), characterized by increased (i) awareness of, (ii) comfort with, and (iii) conviction for the use of collaborative approaches (Table 4.2). These distinct dimensions of capacity were both outcomes of the fellowship, and pathways to enhanced collaborative practice (Figure 4.1).

#### *4.3.2.1 Increased awareness of collaborative conservation*

"I think part of it was honestly simply just having a definition of what collaboration and collaborative conservation is." (Fellow 6, graduate student)

Interviewees expressed learning about the principles, norms, and tools of collaborative conservation. For some, the program “coined a phrase for work that [fellows] had already been doing” (Fellow 30, graduate student), providing an “overlay” (Fellow 16, practitioner) within which to conceptually (re)frame their work. Novice collaborators (both faculty and graduate fellows) expressed “revelation[s]” (Fellow 9, graduate student) that collaboration is more than simply working with people about conservation. Fellows emphasized learning the importance of engaging local, diverse stakeholders early and throughout the process to “make sure different perspectives and parties are at the table” (Fellow 17, graduate student), and investing time and effort to build relationships and trust through listening and patience. The fellowship also introduced a “more formal set of approaches... [and] set of tools to draw on” to accomplish these (Fellow 13, graduate student). Fellows emphasized the importance of seeing how others were approaching collaboration in diverse situations for shedding light on how “conservation is done in the real world” (Fellow 4, graduate student). One practitioner also found it “important to hear early on: ‘this is really hard’” (Fellow 16) to stay committed during a difficult collaboration.

#### 4.3.2.2 *Expanded comfort with people and practices*

“As you develop those skills it’s less of a panic each time, getting better at knowing that it’s messy, and it’s complicated.” (Fellow 8, graduate student)

Surveys indicated that participation improved respondents’ perceived ability to work with a diversity of people in both their short-term fellowship projects (74%) and long-term careers (81%) and to meet the needs of communities where they worked short-term (70%) and long-term (85%). Long-term, most survey respondents reported the fellowship had made them more innovative (83%), and increased their leadership (83%), for instance by enhancing comfort advocating for and directing collaborative approaches.

In interviews, fellows described gaining familiarity, comfort, and confidence with the complex and interpersonal aspects of collaboration, their own collaborative orientation, and with a “wider tool set” of skills (Fellow 29, faculty) and people (Table 4.2). Fellows reported that the fellowship normalized collaboration as an approach, validating their research ideas and desire to work collaboratively, and challenged them to do things differently, including using different methodologies, communication styles and media. The fellowship “made it easier... to work across disciplines” (Fellow 5, graduate student) and communicate across academic rank, sectors, and cultures. It helped fellows become “more confident and comfortable in contentious situations” (Fellow 6, graduate student) and reaching out to new stakeholder groups.

#### 4.3.2.3 *Stronger conviction of collaboration’s advantages*

“It helped me develop kind of a philosophy for myself or a research orientation that felt like it fits who I am and that at the end of the day felt ethical.” (Fellow 22, faculty)

All survey respondents indicated collaboration was ‘extremely’ or ‘very’ important for conservation, and 74% believed collaboration had made their fellowship projects more relevant

locally. The fellowship developed or reinforced many fellows' conviction that community-centred collaborative approaches are preferable to conventional approaches, despite the additional time and energy requirements, reflecting a perception that collaboration's "sum is greater than the parts" (Fellow 17, graduate student). Fellows described different reasons that collaborative conservation is "essential" (Fellows 1 & 20, graduate students), including that it improves the local salience of interventions, and is more equitable. Interviewees emphasized a newfound commitment to replacing extractive researcher-subject relationships with a more egalitarian framing. Some fellows shared paradigmatic reorientations, like learning to "value practice-based knowledge alongside academic knowledge" (Fellow 5, graduate student) or relinquishing control by "letting communities help you define how your research is gonna take place... and what the main concerns are" (Fellow 10, faculty).

#### 4.3.3 Theme 3: Important Inputs to Collaborative Conservation Capacity and Practice

Interviewees expressed difficulty teasing out specific elements of the fellowship to which they attributed their perceived changes. However, both surveys and interviews highlighted that willingness and ability to pursue collaborative practices were primarily supported by the interplay of (i) the funding, particularly its unique flexibility, (ii) the project experience, and (iii) a niche and supportive community of practice (Table 4.2). Together these provided an opportunity and an obligation to practice and internalize collaborative conservation approaches.

##### 4.3.3.1 *Unique nature of funding*

"New ideas were able to emerge because of it" (Fellow 5, graduate student)

Fellows ranked funding as the most influential fellowship component tested ( $M = 4.62$ ) for their short-term fellowship projects, altering project outcomes for 89% of survey respondents.

Kruskal-Wallis ( $H(2)=9.03, p=.011$ ) with Mann-Whitney post hoc tests indicated graduate ( $Mdn=5$ ) and practitioner fellows ( $Mdn=5$ ) found funding significantly more important for their projects than faculty fellows ( $Mdn=4$ ); ( $U=46.50, z=-2.68, p=.007$ ;  $U=15.00, z=-2.30, p=.021$ ; respectively) (Table C.5).

Funding was the most cited reason for applying to the fellowship, as it sometimes supported entire graduate research, or pilot projects, particularly among fellows working internationally. For practitioners and graduate fellows interviewed, the discrete pot of money provided some autonomy from advisors and partners to prioritize collaborative processes and community interests. Flexible parameters allowed fellows to try different approaches unsupported by other funding mechanisms, including experimenting with new tools, such as photovoice, in which they subsequently developed expertise, or regranteeing their funds to local initiatives. Flexible timelines for expenditures and reporting also allowed fellows the time to better understand and align their projects with local interests. Flexibility was especially important to fellows exercising collaborative norms of reciprocity (e.g., paying for partner food and travel, leaving camera equipment with communities).

#### *4.3.3.2 Fellowship project experience*

Fellows' ranked projects as the most valuable fellowship input tested for their careers (mean = 4.38). Fellowship projects ( $Mdn = 5$ ) produced significantly more "insights" than did the Fellows Program more broadly ( $Mdn = 4$ ) ( $T=30, z=-3.27, p=.001$ ) (Table 4.1) and in aggregate, T-tests indicated greater mean long-term impacts from fellowship projects than from the Fellows Program ( $t(45) = 2.12, p = 0.040$ ) (Table C.4).

Interviews reaffirmed the importance of projects, revealing two general pathways by which these built fellows' ability and willingness to collaborate. First, projects provided a platform to gain exposure to and practice collaborative conservation approaches. For some, projects provided an entrée to unfamiliar or previously intimidating partners and stakeholder groups, such as government officials. For others, it provided "full license to go deeper" (Fellow 29, faculty) and prioritize building familiarity with new systems, geographies, and methodologies. Working through real collaborative processes and challenges, including failures, and unanticipated and unintended scenarios, increased interviewees' comfort with the complex, context-specific, and sometimes contentious nature of collaborative conservation.

Second, fellows reported that project experiences provided first-hand evidence of the realized or potential benefits of collaboration to communities or projects, reinforcing their conviction to collaborate (Table 4.2). Fellows sometimes reassessed research assumptions and adjusted projects to address local stakeholder needs and interests, or applied such changes in their later work. As a graduate fellow put it, the project "helped me see 'oh my gosh, there's all these other things they care about environmentally that I'm not looking at'. Had I talked to people in the first place, I could've done a whole different project that's way more useful to them" (Fellow 15).

#### *4.3.3.3 Community of practice*

"That feeling of belonging to something bigger was emotionally really helpful. And again, professionally too." (Fellow 27, practitioner)

Surveys indicated that the fellowship increased collaboration in fellows' projects (80%) (Table 4.1), with 89% of respondents classifying their projects as extremely, very, or moderately collaborative. Interviewees identified cohort make-up, interpersonal interactions, a supportive

organizational culture, and a sense of belonging as particularly valuable for learning, feeling supported, and challenging themselves. Fellows were drawn to the fellowship “...not just to learn best practices” (Fellow 26, graduate student), but due to an affinity with the program mission and community. Acceptance into the fellowship provided recognition, validation, and a “home” (Fellows 2 & 6, graduate students; Fellow 29, faculty) to those who previously felt isolated in their desire to work collaboratively. One graduate fellow in the natural sciences reflected that “finding your people with commonalities... makes you feel like less crazy, less of an imposter, and then helps you formulate better research questions” (Fellow 2).

Interactions with staff and other fellows precipitated short- and long-term learning and inspiration. Fellows identified learning from people “doing similar things in different ways” (Fellow 26, graduate student), emphasizing that the diversity of disciplines, academic ranks, geographies, scenarios, ideas, and tools represented within their cohorts was key for gaining a broader perspective about collaboration and their own work. As a faculty fellow summed up, you “learn a lot from contrast” (Fellow 10). For another fellow, however, being the sole practitioner in the cohort was isolating.

Learning of others’ accomplishments and proposed work led fellows to set aspirational benchmarks, and even lament they “didn’t go bold enough” (Fellow 28, faculty) in their projects. An organizational culture supportive of experimentation and even failure was noted as critical to enabling such forays into new tools and methods. To many fellows, the personalized attention and authentic guidance of organizational leadership provided inspiration. But for some interviewees, the mere existence of a community dedicated to collaboration both “lowered

hurdles” (Fellow 30, graduate student) to collaboration, and afforded it “gravitas” (Fellow 11, practitioner).

In contrast to interviews, survey respondents ranked periodic fellowship meetings as the least meaningful fellowship component for both their short-term projects and careers (Table C.5). Kruskal-Wallis with Mann-Whitney post hoc tests indicated natural science fellows ( $Mdn=2$ ) found periodic meetings less useful than social science fellows ( $Mdn= 4$ ) for their fellowship projects ( $H(2)=7.72, p=.021$ ) ( $U=41.00, z=-2.69, p=.007$ ), but not for their careers (Table 4.1; Appendix C). Natural science fellows also perceived the network provided by the fellowship as a less useful ( $Mdn= 2.5$ ) than those in the social sciences ( $Mdn= 4$ ) for their careers ( $H(2)=12.39, p=.002$ ) ( $U=40.00, z=-3.59, p<.001$ ) and their project outcomes ( $U=38.50, z=-3.64, p<.001$ ;  $Mdn=2$ ;  $Mdn= 5$ , respectively).

#### 4.3.3.4 Other inputs

Training sessions had comparatively low utility for both project and career outcomes ( $M = 3.5$ ;  $3.31$ ; respectively) (Table C.5). Fellows interviewed mentioned training less often and more briefly than other fellowship inputs described above, and several reported feeling topics were too superficial or poorly instructed. However, tools taught in training sessions had significantly greater impact on fellows’ long-term career than on their short-term projects, based on Wilcoxon Signed Ranks Test ( $p<0.050$ ). Similarly, the Fellows Program had significantly higher mean impact on (long-term) career ( $M=4.04, SD=0.70$ ) than on the (short-term) fellowship projects ( $M=3.89, SD=0.66$ ) ( $t(43)=2.74, p=.009$ ) (Table C.4).

#### 4.3.4 Theme 4: Systems-level Impacts of Collaborative Projects

“A fellowship that forces you to be involved locally and to bring in local collaborators, which then gives you insight into what’s going on at a local level and what people are struggling with, that all led to...establishing an NGO.” (Fellow 22, faculty)

Most survey respondents felt that collaboration had made their projects more relevant to the local community (74%) and helped build community capacity to deal with conservation issues (72%). About half reported their projects continued beyond their fellowship (56%).

However, no interviewee reported having conducted a project evaluation during or since their fellowship, including senior researchers and practitioners. Reasons included not knowing how; lack of funding, previous plans, or obligation to do so; changes in career focus away from the study area; discomfort evaluating voluntary partners; inability to tease out their component from a larger initiative; transferring project ownership to local partners; and difficulty connecting project outputs (e.g., species distribution maps, interviews with elders, study of a failed process) to social or ecological impacts.

Instead, when asked about project impacts, some interviewees shared that their projects had been formalized, replicated, or expanded to serve additional communities or systems, informed legal proceedings, or culminated in initiatives requested by local communities (e.g., elementary education, training in evaluation). Fellows reported financial benefits to partner communities, empowering communities to mobilize, and building relationships with communities and partners, itself considered an “important and underrated outcome” (Fellow 24, faculty). In one project, community members used cameras to start businesses and to assert local perspectives on drought impacts to decision-makers. Another project workshop spurred

participants to propose ways to transfer traditional knowledge to the younger generation and apply for funding to cultivate traditional crops for income.

## 4.4 DISCUSSION

### 4.4.1 Situating Individual Impacts

Our retrospective evaluation suggests that an 18-month fellowship can result in long-term changes in participants' capacity for and adoption of community-oriented collaborative approaches to conservation. Previous evaluations have demonstrated that training can build professional capacity and enhance participants' community-oriented attitudes (Ries, 2019; Sawrey et al., 2019) but ours is the first, to our knowledge, to demonstrate long-term changes in collaborative conservation mindset, mastery, and practice (Figure 4.1). Our findings highlight that despite minor differences, a fellowship-style opportunity to build capacity in collaboration was salient across disciplinary backgrounds and at different career stages, including to senior faculty.

We find that adoption of new practices are preceded by the development of an array of social-psychological antecedents beyond knowledge acquisition, as demonstrated elsewhere (Reddy et al., 2017), including changes in attitudes, comfort, and norms (Figure 4.1). Notably, although gaining skills in community engagement has been proposed as a precursor to being willing to engage with communities in protected area management (Scholte et al., 2006), we find that conviction sometimes precedes competence. Fellows in our case intentionally pursued new and sometimes uncomfortable approaches and forays across boundaries, suggesting that building conviction, and doing so early, may motivate commitment to self-directed capacity building in new professional norms. Fellows' convictions reflected values such as efficacy and

equity, aligning with Estrada et al., (2011)'s findings that connecting with individuals' values is a strong motivator to persist within a scientific community of practice.

Other collaborative capacity interventions could build out these capacity dimensions alongside content knowledge and skills, drawing on behaviour change approaches summarized elsewhere (e.g., Stern 2018). For example, our results evoke the elaboration likelihood model (ELM), which suggests that motivated audiences engage with information differently, and show more persistent changes in attitude and behavior.

#### 4.4.2 Situating Capacity Building Inputs

Our research supports the finding that exposing people to knowledge and tools is not sufficient to build capacity (Englefield et al. 2019). Instead, it highlights the importance of experiential and relational components, supported by flexible funding and a safe community of practice for building willingness and ability to pursue complex, relational, and context-specific approaches.

Practice with authentic experiences increases the likelihood that skills will transfer to similar situations (Caffarella, 2002; Wlodkowski, 2008), and the cultural and social aspects of learning by doing (Morris, 2019) are particularly relevant to collaborative conservation. Experiences with novel, uncertain, or challenging situations may also spark reflexivity, challenging learners' previously assimilated concepts (Kolb, 1984; Morris, 2019). This aligns with the paradigm shifts we noted with some Center for Collaborative Conservation fellows. Experiential learning engages learners both intellectually and emotionally, underscoring the importance of actively and explicitly cultivating psychological safety among participants to support experimentation on the path to mastery (Catalano et al., 2018).

Funding plays a role in driving shifts toward collaborative governance (Abrams et al., 2020) and collaborative research framing (Wuelser & Pohl, 2016). We also found that funding served to catalyze collaborative capacity building, attracting individuals who may not have otherwise been exposed to the norms of the community of practice. Funding flexibility was particularly instrumental for enacting collaborative norms, such as reciprocity and adapting to partner interests. In this case, the impact of funding was tightly coupled with an organizational culture that inspired and expected new practices and developed conviction, which may be key for small grants to have transformative impact.

Our results underscore that association with the community of practice (CoP) was critical to fellows' pathways of change. CoPs, increasingly called for to address complex environmental problems, are groups of people who build individual performance and identity, relationships, and collective results through shared and sometimes curated engagement activities around common interests (M. G. Reed et al., 2014; Watkins et al., 2018; Wenger, 1998). Although the fellows worked in (largely) non-related projects, we found that many adopted the collective norms and social identity of the collaborative conservation CoP, which provided framing for what is possible, expected, and desirable (Wenger, 1998) in their projects and longer term. For many, a sense of belonging to a dispositional home was foundational for committing to and persisting in the field (Mourad et al., 2018), and learning benefitted from a safe space and a balance of similarity with diversity in ranks, fields of study, and geographies.

Fellowship projects concurrently served as curated activities of the fellowship CoP, and distinct CoPs where fellows worked with collaborators in disparate geographies, systems, and sectors. As such, the CCC fellowship may be shaping a growing landscape of practice made up of

core individuals across organizations, bound loosely by their similar practices and sense of commitment to collaboration (Pyrko et al., 2019), an unanticipated systems-level impact.

Despite fellows' strong emphasis on learning from and building connections with cohort and staff, the interactive components we tested (periodic meetings and networking with fellows) ranked low, especially among natural science fellows. The reasons for this are hard to trace because periodic meeting content evolved over the years, and program staff reported that attendance at meetings fluctuated, particularly among faculty. Survey questions may have also failed to make salient the social elements within training retreats or other group activities that supported relationship building and discussions.

#### 4.4.3 Balancing Individual Capacity Development with Systems-level Impact

The Fellows Program pursues livelihoods and conservation impacts through the fellowship projects it supports. However, we found little evidence that fellows had formally measured social or ecological outcomes from their projects. This was unsurprising, given that assessment of systems-level impacts in collaborative conservation is uncommon (Wilkins et al., 2021), particularly for ecological outcomes, which are often delayed, distal to, or difficult to link to the collaborative intervention (Conley & Moote, 2003; Koontz et al., 2020).

We note that that the fellowship's simultaneous individual and systems level goals may represent a trade-off. Seeking to achieve on the ground impact through trainees may unintentionally undermine the program characteristics that support the types of transformative changes we found in the fellows. For instance, project failures, which were valuable learning opportunities for fellows, may have no measurable impact to communities or ecosystems. A preference for accepting experienced participants or established collaborations, and an

emphasis on *achieving* conservation goals rather than *learning* complex relational capacities, could lead to greater social-ecological systems impact during the funded project, while inadvertently stifling individual experimentation, and raising epistemic barriers to entry for novice collaborators (Wenger, 1998). This could reduce a program's ability to attract more inexperienced fellows or those hoping to learn new approaches – the very participants who might grow the most from the fellowship. Additionally, challenging participants to try new skills and approaches, such as using alternative media, may reduce short-term proficiency and impact, but prove valuable in the long run, as we saw with fellows attributing greater long-term impact from the fellowship than short-term.

One approach to navigating these trade-offs could be the use heuristic models (Cockburn et al., 2020) or Theories of Change in trainings to improve fellows' evaluation know-how, identified as a gap by fellows, and potentially improve projects. Fellows would gain practice identifying what would be measured, why, and by which methodologies. Explicitly working through the mechanisms and influence of context could improve the likelihood of achieving desired impacts (Clement et al., 2020; Emerson & Nabatchi, 2015). Doing so within diverse disciplinary cohorts could build interdisciplinary competence (as called for by Bennett et al. 2017) and support integrated assessment of social and ecological outcomes (Koontz et al., 2020).

Second, a networked community of practice model (Figure 4.2), characterized by sustained partnerships in specific locations across multiple fellowship projects, could help programs like this achieve individual and systems-level objectives concurrently. We were not able to evaluate fellowship impacts from the perspective of communities and collaborators, due to the diversity of fellows' projects and a lack of contact information for past project partners.

However, repeat projects in one locality could enhance the program’s ability to impart, assess, and detect social and ecological changes. Moreover, since collaborative approaches seek not only to work with local people, but to divest power to stakeholders (Larson & Ribot, 2004), longer investments in locally-led, place-based groups can reduce “parachute” involvement (Asase et al., 2021). Financially supporting the types of community-generated projects fellows reported could augment collaborator self-efficacy (Bruyere et al., 2021) and involving collaborators in developing and assessing heuristic models (Onyango, 2018) could increase local capacity, key in achieving social and ecological benefits (Brooks, 2017).

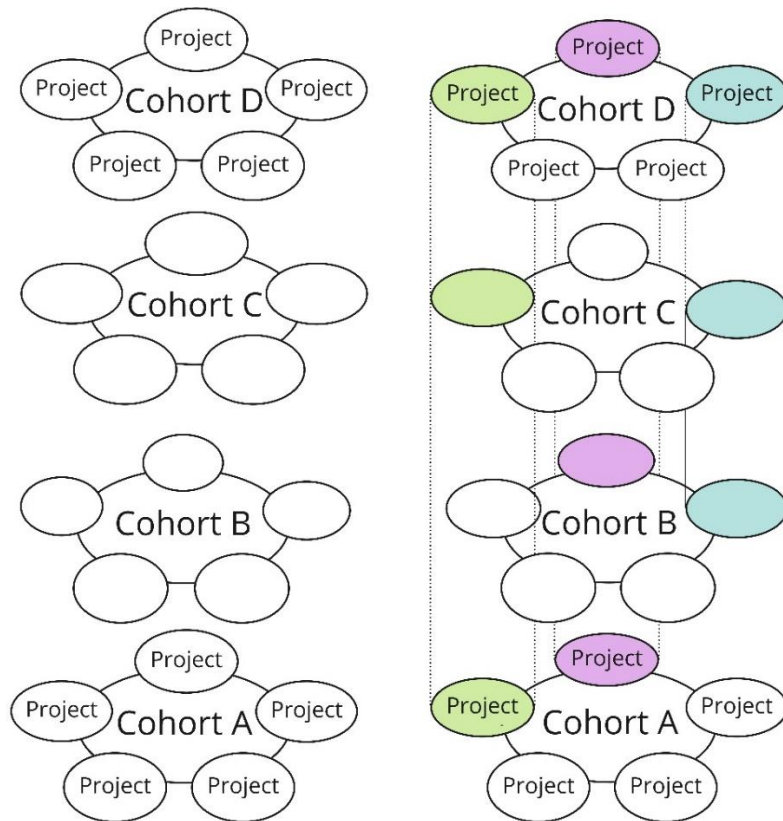


Figure 4.2. Networked community of practice model (right) characterized by sustained attention to localities over multiple fellowships would link current (left) siloed cohort communities of practice (CoPs) and project CoPs and provide opportunities for mentoring.

Both the funding and the fellowship community filled a perceptible gap for fellows. However, we found that fellows rarely remained involved in the fellowship community after their tenure, and that the program fell short of providing a strong network, particularly for fellows in the natural sciences. As collaboration becomes more commonplace within conservation, maintaining high impact for participants may require adaptations to meet fellows' changing expectations. A networked community of practice model could increase learning across previously siloed cohorts, while engaging fellows and alumni in differentiated roles, for instance through mentoring (Dietz et al., 2004; Robins, 2008).

While this research showcases the strengths of a retrospective study using qualitative analysis to identify important inputs, our study had limitations. Although we achieved a good response rate (51%) from representative proportions of fellow types, and received responses from alumni who did not rate the fellowship highly, all survey respondents felt collaboration was extremely or very important for conservation. This may reflect self-selection bias. Concurrent delivery of survey and interview methods, precipitated by short program reporting deadlines, means we were unable to explore findings from the survey in our interviews, such as differences among disciplines. Nor did we have baseline data on fellows' experience or competency levels prior to participation. However, the program has begun to add quantitative measures to gauge short-term changes in perceived competence, a practice used in the evaluation of similar conservation capacity development programs (Sandbrook et al., 2022). We also recommend gathering data on gender and other identity attributes, to understand how these relate to program impact on the individual.

## 4.5 CONCLUSION

This research confirms the importance of belonging to a dispositional home or community of practice and applied experiences, including experimentation and the possibility of failure, in supporting deep learning and the development of competence and willingness to adopt new norms in this complex and context-specific field of collaborative conservation. Achieving target behaviors requiring paradigmatic shifts may benefit from building participants' conviction early, to support commitment to practice. Maintaining low epistemic barriers may allow programs to attract participants new to collaborative conservation, but requires recognition of potential trade-offs between individual and systems-level impacts without the integration of supportive practices like networked communities of practice and use of heuristics. In these ways, collaborative conservation researchers and practitioners can continue to move the needle on how to work effectively and collectively to address today's most complex and urgent ecological challenges.

## CHAPTER 5: CONCLUSION

This dissertation advances understanding of the benefits and challenges of participatory approaches to research and management of social-ecological systems. As such, I join a cohort of researchers who both call for enhanced opportunities for local participation in social-ecological decision-making and research, and critique its use.

My three empirical chapters present insights at various rungs on a “ladder” of participation. The first chapter shared the experiences and perceptions of local participants of delegated Local Ecological Monitoring (dLEM). The second shed light on the perspectives of organizers designing and delivering such programs with local actors. The last empirical chapter identified the processes of a program influencing the landscape of practice in sustainability science by expanding the adoption of participatory approaches.

Across the three empirical chapters, two focal themes were pervasive. The first is the critical role of intentional design on program outcomes. Specifically, the need for holistic, systems-thinking in programs intended to enhance local influence on (and capacity to engage in) equitable SES management. Systems thinking calls for explicit consideration of connections – e.g., between actors and across scales (temporal, levels of influence) (Knight et al., 2019), to recognize the influence of contextual factors, scale, and issues of power (Reed et al., 2018). Programs must recognize and adjust for a changing constellation of influences within the design.

For instance, in Chapter 2 I show that delegated local ecological monitoring programs introduced to locally co-managed marine protected areas throughout the central Philippines failed to achieve the long-term benefits desired for participants or social-ecological systems

management, in large part because of the narrow focus of the design. These programs were designed intentionally in many ways – including the creation and introduction of simplified methodologies and technologies, and the inclusion of actors representing existing institutions at nested scales- ways that reflect best practices in the literature (Danielsen et al., 2008; Ostrom, 1990). But these programs were designed for the purpose of monitoring biodiversity, an objective not often salient with local communities.

Clearly, the region-wide programs in the Philippines were not co-created. Given that the intention was to delegate ownership of monitoring to local actors as a tool to enhance management capacity, they arguably should have been. The literature is clear that information is more likely to be used – and hence also likely generated – if it is salient to the intended users (Cash et al., 2003; Reed, 2008; Reid et al., 2014). But it should be noted that even a high degree of participation in the process (e.g., identifying what should be monitored, what indicators to include)- as occurs with programs labeled “extreme citizen science”- may not lead to local use of information (Hoyte, 2021). Information may instead be managed by local NGOs, and the local communities (i.e., those co-creating data collection projects) may not have the capacity to use the information to affect change. This was the case with in dLEM in the Philippines. Although in a different context the same approach may have resulted in very different (e.g., empowering) outcomes, these programs were unsuccessful in achieving their intended outcomes largely because they neglected to acknowledge and intentionally design for the wider psycho-political context within which they operated.

Where participation is intended to build collective capacity for autonomous decision-making in SES management (i.e., collective action), a stronger focus on facilitating action over

knowledge is required. This means recognizing and designing for structural as well as individual barriers, such as informal power and low agency. For instance, considering what agency the participants feel they have in order to take action (i.e., make decisions and enact those decisions); what mechanisms are available to influence change; and what the “fit” of the data being collected is with the sphere of influence of the participants.

In Chapter 3, the conflicts between organizer rationales for engaging local actors in the types of dLEM programs that failed to sustain in Chapter 2, further highlight a lack of explicit and systems-oriented design, and its influence on program success. In this case the underlying objectives and logic for engaging local actors to collect data in delegated marine local ecological monitoring programs conflicted both within and between rationales and were likely unacknowledged by organizers themselves. Since the design of participatory programs influences outcomes, and intention influences design (including the modalities of participation chosen (Luyet et al. 2012)), it is critical to clearly and explicitly acknowledge the underlying objectives and logic for engaging local actors to produce data. Organizers in the Philippines expressed both normative and instrumental rationales, despite program operationalization (i.e., design) reflecting almost exclusively instrumental rationales. Thus, although participation may have been pursued based on the normative premise that communities have a right to participate, the modalities provided for participation likely contributed to a perception among monitors of being “cheap labor”, and to the erosion of agency witnessed in Chapter 2.

Chapter 4 identified the meaningful programmatic elements of a program aimed at supporting the ability and willingness of professionals to adopt community-oriented collaborative approaches to SES research and management, despite the additional investments of time and

energy required. As with many programs, a theory of change was implicit, and my retrospective evaluation found that individual capacity for and adoption of collaborative practices were supported more by tacit, rather than structured, program components. Specifically, the introduction into a community of practice, which both elevated and normalized the collaborative approach unsupported elsewhere, and the opportunities and obligations to practice norms of collaboration in individual projects, had greater influence than formal “training” components. These results underscore the benefits of approaching “training” in a holistic way that recognizes the importance not only of cognitive, but also affective aspects of building capacity. Explicitly identifying the most (and least) meaningful components earlier would have allowed these to be strengthened explicitly, rather than be reliant on staff retention.

As collaboration becomes more commonplace and less niche in SES research and management, a systems-thinking perspective could help the program maintain relevance for participants into the future, by considering and adjust for the changing landscape, and hence participant needs, within which it operates. Further, a systems-thinking approach considering both multiple scales and longer timeframes is key to concurrently achieving and assessing systems-level objectives, alongside impacts on individual fellows. Instead, proposed changes intended to enhance the impact of the program’s investments (i.e., conservation outcomes of fellows’ funded projects), may undermine the (tacit) program components that were key to supporting long-term and sometimes transformational individual-level impacts.

The second theme to permeate the chapters regards the influence of assumptions on the ability of programs to support equitable and effective SES research and monitoring. Chapter 2 highlighted the wide-spread, and potentially detrimental assumptions regarding the benefits of

participation. This chapter demonstrated that despite the widely asserted normative value of participation, uncritical application of “participatory” approaches to ecological monitoring can reaffirm, rather than dismantle, hierarchical relationships. Further, in monitoring programs for which responsibility is delegated to local actors, participation can be perceived as a burden rather than a transfer of power to participants. Chapter 3 identified conflicts between and within rationales for engaging local actors. These conflicts reflected assumptions by program organizers about the potential of dLEM programs to produce beneficial outcomes for both their interest and those of participants, without explicitly and frankly acknowledging what those interests and assumptions were. This led to designing a program without the input of the community, reflecting an externally determined agenda – a common characteristic for capacity building materials to be determined by outsiders (Sterling et al., 2022).

Together, these chapters highlight the need for more synthetic and analytic work to match participation modalities with distinct contexts and objectives. Mainstreaming of a multi-dimensional conceptualization of participation, rather than a unidimensional “ladder” (Arnstein, 1969; Danielsen et al., 2008; David-Chavez & Gavin, 2018; Pomeroy et al., 2004), is critical for more effective and equitable application. More transparency about what is meant by participation is needed (Woolley et al., 2016) to avoid being used as a substitute for the structural reforms needed for social change (Claridge, 2004), and could include degree, intensity, technique, and form, among other aspects. For instance, although much of the literature on the benefits of participation in SES management relates to decision-making, management largely entails conducting tasks not related to decision-making (Pinkerton, 1989), including knowledge generation. Although such a distinction in the form of participation is crucial in predicting and

achieving potential benefits, it is absent from common definitions of participation (IAP2, n.d.; Aarhus Convention, 1998).

Despite the push towards greater participation, more participation is neither always better nor desired (Bailey & Grossardt, 2010; Sterling et al., 2019), and not all LEM programs can be co-created, nor should be. “Contributory” programs (Shirk et al., 2012) play an important role in sustainability science, by contributing to data to address global sustainability problems (Fritz et al., 2019), and for providing participants with social outlets, venues for personal growth, and opportunities to “contribute” to causes important to them.

However, frank and explicit acknowledgment of rationales for selecting participatory approaches, whatever they may be, are crucial to increasing the feasibility of achieving objectives, including multiple concurrent objectives. Although the dual goals and tensions in sustainability science are often portrayed as social and ecological outcomes, my research also demonstrated tensions between (and a desire to achieve) individual and system-level objectives; short term v. long term impacts; and issues of local v. global importance).

Research on participatory management arrangements has taken steps to systematically assess whether and why they are achieving both social and ecological benefits (Galvin et al., 2018), but PPSR lags in this regard. Although PPSR distinguishes between degrees and quality of participation, it fails to relate these to the potential for concurrent instrumental (cost), substantive (salience), and normative (democratization) outcomes. It’s time to move beyond assertions of what local monitoring and participatory forms of research *can* achieve (Bonney, 2021; Danielsen et al., 2021), for a more honest, nuanced, and systematic examinations of *when and why* desired outcomes arise, or fail to do so (Ferraro & Agrawal, 2021).

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## APPENDICES

### APPENDIX A

#### Semi-structured Interview guide for LEM monitors

##### On training:

1. Please tell me about the most recent time you were trained in coral monitoring (e.g., by whom / topics / format / year).
  - a. Have you also been trained before that? Can you tell me about that time.
2. Which parts of the trainings were most useful to you? Why?
  - a. Which were not useful? Why?
  - b. Which were difficult for you? Which were easy?
3. What did you expect would happen next after the training? (Did you have expectations of next steps?)
  - a. If so: who did you think would provide those next steps?
  - b. If so: did it happen? / were your expectations fulfilled?
4. How did you think you would use what you had learned?
5. How did you become involved?
  - a. *If they were selected:* Why do you think you were selected?
    - i. And why did you accept? What were your reasons/motivations for joining?
  - b. *If they address personal motivations:*
    - i. How did you get the opportunity?

6. Why do you think they trained you to monitor?
  - a. In your opinion, why you think [XX agency] trained fishers to monitor?

On monitoring:

7. Did you conduct monitoring after the training?
  - a. *If yes above:*
    - i. Please tell me about those times (years; roles; who else was involved and how?)
    - ii. How is/was it decided when to monitor? How do you know when to monitor? (who organized it?; how were you notified?)
  - b. (The years) when you don't monitor, why is that? (what reasons keep you from monitoring?)
8. Do you (*bantay dagat* / fisherfolk organization) ever monitor on your own, without [XX agency above]?
  - a. If yes, please tell me about those times.
  - b. If no, what would be needed to do it without [XX agency above]?
9. In your opinion, is/was monitoring useful?
  - a. In what way? or Why not?
10. Who do you think should monitor? Why is that?
  - a. And who do you think should analyze the data?
11. What do you think should be monitored?
12. In your opinion, what is the purpose of monitoring?

On data:

13. What data do/did you collect?

14. What happens to the data collected?

a. How is it used?

On resources:

15. Have you noticed changes in the ocean that you are concerned about?

16. Do you have any concerns related to the ocean or the MPA you would like to know more about?

## Supplemental methods

Early translations of Bisaya transcripts were interactively translated into English by the first author and native Bisaya-speaking field assistant while in the field. The field assistant explained the meaning, and the first author clarified and transcribed into native English. The majority of interviews were later transcribed and reviewed by two native Bisaya speaking assistants or translators. Translators followed detailed transcription guidelines to denote where translations included paraphrasing or interpretation. The first author then iteratively sought to clarify on areas of confusion or differences in interpretation. At times both versions were retained to add depth to the meaning.

## APPENDIX B

### Semi-structured Interview guide for LEM organizers

1. Where have you [in your capacity at xxx] worked with communities to implement biophysical monitoring?
  - a. How were the sites / participants selected?
  - b. How was the community involved in monitoring?
  - c. How was the community involved in training design?
  - d. What was the duration / frequency / intensity of training?
  - e. How was it decided what was going to be monitored?
  - f. Has your program included any training in “management response” (or how to select appropriate responses in the MPA based on what they are seeing during monitoring)?
2. In your opinion, what is the value of monitoring coral?
3. Why did [your organization or project] train fishers (or municipal officials) to conduct monitoring?
  - a. In your opinion, what are the benefits of (training) communities to conduct biophysical monitoring?
  - b. What are the challenges or drawbacks?
4. What were the expectations after training occurred (over the next 1-2 yrs)...?
  - a. Of the trainees?
  - b. Of the municipality?
  - c. Of your project or organization?

5. How did the project try to support those expectations (in response to #4 above)?
6. Where would you say community monitoring has been successful?
  - a. In your opinion, what are the key elements to that success?
7. What do you think are the factors that help sustain community monitoring in these situations?
  - a. In your experience, what would you say are the reasons others are no longer monitoring? What are some challenges to continuity of monitoring?
  - b. Was sustainability (continuity) a project priority? Did the project include explicit considerations to support continuity of monitoring?
8. What monitoring methods does your organization use?
  - a. In hindsight, what are the elements you consider most important in developing a community monitoring method for locally managed MPAs?

Now that we have had the opportunity to chat, do you have recommendations on other individuals that I should try and speak with?

## Descriptions of participatory workshop sessions with marine LEM experts

### Session 1: Regional LEM Inventory

Participants were instructed to complete one worksheet (individually or in groups) per training intervention. We recorded municipality, and barangay(s) / MPA(s) included (if applicable); year; number of persons trained, and whether those were fisherfolk or municipal staff; days of training; number of staff; LEM focus, methodology and modality (scuba or snorkel); new or refresher skills; funder, if applicable; and stages that participants influenced or participated in. These were posted by year.

### Session 2: Reflecting on Expectations for LEM

Participants were asked to reflect upon their organization's expectation regarding participatory monitoring in terms of impacts to the community, the focal MPA, science, and their own involvement. Participants were asked to record these on individual prompt sheets, and highlights shared with the group were recorded on flip charts.

### Session 3: Mind-mapping Obstacles to Sustainable LEM

STEP 1: The 24 participants were divided into 3 groups (two focused on the Central Visayas and one for other areas of the Philippines) and provided a large sheet of paper and enough markers for each person. Each group was asked to reflect on obstacles to the mid-term continuation (from six months to 2 years after training) of participatory monitoring. We

recommended placing “sustainable participatory monitoring” at the center of the map, drawing out and linking obstacles.

STEP 2: After completing their mind maps, groups were asked to mark items identified in Step 1 as issues LEM programs designers / implementers had (a) control over (b) some influence over, or (c) no control over. Participants were asked to focus on those obstacles they had marked as (a) or (b) (having control or influence over) for Step 3. (*For example: continue training new volunteers; Not: political turnover*).

STEP 3: Small groups were then asked to prioritize the most priority obstacles to sustainability on their mind-maps. Each participant was given five stickers (i.e., votes).

STEP 4: The three issues that received the most votes from each mind map were merged into a single meta-map by the lead author, with active participant input in order to improve merging and reduce redundancy.

STEP 5: The 24 participants were given new stickers and asked to vote again on the meta-map, indicating the issues they believed to be the most important to address sustainability in LEM. The top three issues collaboratively identified, plus one issue identified by the researcher, were addressed in Session 4: Co-developing Sustainability Solutions Knowledge Café.

Select workshop questions

1. In your opinion, what is the objective / purpose of monitoring coral [in general]?
2. Why did [your organization] train fishers (or municipal officials) to conduct the monitoring?
3. What were the expectations after training occurred (over the next 1-2 yrs)...?

- a. ...of the trainees?
  - b. ...of the municipality in general related to monitoring?
  - c. Do you think the trainees /LGUs had any expectations of DENR after the training?
4. How did the project try to support those expectations (*use examples from response to #3 above, if they answered*)?
5. Do you feel the trainees have all the skills they needed to monitor and use it after the program (of training)?
  - a. If no, is there plan to return for refresher? (Try to get a concrete answer)
6. Did the project include any explicit considerations to support sustainability /continuity of monitoring?
7. In hindsight, what are the elements you consider most important in developing a monitoring method for locally managed MPAs?
8. In your opinion, what are the benefits of (training) community biophysical monitoring?
  - a. What are the drawbacks?

## Supplemental background

In the two decades prior to 2017, approximately 2366 person-days of training were invested in 41 communities, training approximately 763 fishers and 222 local officials (Hauptfeld, *unpublished data*). Although participatory monitoring programs vary somewhat by organization, training events generally lasted 2-3 days, beginning with lectures on marine biology and threats, followed by orientation to data collection methods, first on land and then applied in the water, and finishing with graphing and/or presenting results. Training organizations generally followed or adapted Uychiaoco et al.'s (2001) methods designed for local coral reef monitoring by fisherfolk. Organizations sometimes provided refresher days in subsequent years or invited trained individuals to assist in organization-driven monitoring. Trainees were primarily members of fisherfolk organizations or cooperatives associated with co-management of a barangay-level MPA (i.e., fishers), and less frequently municipal staff whose roles include marine and fisheries functions (Hauptfeld, *unpublished data*). Municipalities encompass several barangays, and potentially MPAs. Training most often occurs in the MPA of the community (i.e., *barangay*) where trainees reside. In addition, cluster trainings, in which trainees from several *barangays* and/or municipalities attend, also occur. Despite these efforts, local marine monitoring in the Central Visayas appears to not have been successfully sustained, given a variety of factors (Hauptfeld et al. *in review*).

## APPENDIX C

### Background on the Fellows Program

The Center for Collaborative Conservation (CCC) is founded on the philosophy that “collaboration can result in more enduring conservation outcomes because it taps the power of collective wisdom, diverse viewpoints, and resources of a community while addressing local social, economic and ecological concerns in decision-making”. The fellowship’s request for proposals indicates that “The Fellows Program is designed to strengthen the real-world impact of the work of students, faculty, research scientists, and conservation practitioners by encouraging these groups to work together on joint conservation projects that use collaboration to address research, education or natural resource management issues.” The CCC Fellows Program’s activities contribute to Colorado State University’s land grant mission of research, education, and service for the benefit of the citizens of Colorado, the United States and the world. As an extension of the CCC, fellows’ funded projects have addressed each of these mission areas, and some have addressed all three (Skyelander et al., 2019).

Fellowship projects have sought to better understand and/or address myriad challenges. To do so, fellows have initiated or engaged with agriculture cooperatives, business models, citizen science, collaborative modelling, energy policies, local and traditional knowledge, payment for ecosystem services, photovoice, private land conservation, network building, qualitative research methods, science communication, sustainable tourism, among other strategies. Projects also varied in collaborative stage addressed, from scoping and problem

definition, to retrospective evaluation of a failed collaborative, and (in limited cases) follow-up stages of previous projects.

The number of fellowships awarded annually varied based on the Center for Collaborative Conservation's budget and quality of proposals. The acceptance rate was approximately 30-50%. Applications were reviewed by teams of CCC staff and alumni, who ranked them according to a series of considerations, discussed their strengths and any concerns, and provided applicants with suggestions for improvements. In addition to addressing both ecological and social issues, applicants are asked to reflect on and describe for their proposed outcomes, beneficiaries, and whether the projects addressed community needs; the proposed process for engaging stakeholders, which stakeholders were involved, and whether a portion of funds were designated for collaborators; whether the project represented enhanced collaboration for the applicant; and whether the project goals and timeline were realistic, creative, and met the core values of the CCC, and had adequate measures to determine whether the project met its goals.

The Center for Collaborative Conservation Fellows Program has evolved throughout its existence. Initially, the fellowship awarded exclusively individual fellowships (\$5000 and \$8000 for graduate student and faculty fellows, respectively) (2009-2015). To increase the quality of both the fellowship proposals and encourage the establishment of stronger, more transparent collaborations prior to the start of the funded project period, team fellowships (\$15000 for teams up to 5 people, including at least one practitioner and at least one Colorado State University representative) were introduced during Cohorts 7-8 (2015-2016). Team fellowships provided financing for project collaborators to attend training retreats, where teams conducted stakeholder analysis and situation assessment together.

**Fellows Program goals** Identified from a review of ten years of fellowship print and online documents:

- (1) To bridge disciplines by providing financial means to bring livelihood and conservation goals together for projects that historically would have focused on one or the other.
- (2) To increase the relevance of conservation research to issues on the ground by involving communities and building partnerships.
- (3) To build a collaborative conservation community of practice through regular meetings and opportunities for face-to-face as well as online exchange and relationship-building.
- (4) To train Fellows in key aspects of collaborative conservation.
- (5) To create the 'new conservationist' who puts people at the center of conservation and uses collaboration to spur innovation by working with diverse groups of people.
- (6) To find new and more appropriate solutions to priority conservation problems by directly involving communities in all project activities.
- (7) To build a network of 'new conservationists' by sharing experiential, local and scientific knowledge among fellows about key aspects of collaborative conservation.
- (8) To have larger and more important impacts on people and conservation by asking fellows to work across boundaries, whether they are disciplinary, landscape, cultural or administrative.
- (9) To find new solutions to conservation issues by 'helping communities help themselves'.
- (10) To challenge students, faculty, and practitioners to use a collaborative approach to help communities improve their livelihoods and contribute to local and global conservation goals. Fellows work across disciplinary, landscape, cultural, and administrative

boundaries with community partners and diverse stakeholders to find new solutions through on-the-ground projects around the world. These projects are rooted in collaborative learning, research, and action. The work of these fellows leads to stronger networks and relationships between those who study collaborative conservation and those who practice it. Our vision is to create the “new conservationist” who is passionate about using a collaborative approach to bring together different knowledge systems to create solutions to today’s complex conservation issues.

- (11) To create leaders who are skilled in the art of collaboration, including being adept communicators, facilitators, listeners, problem-solvers, and boundary spanners, comfortable working across disciplinary, landscape, cultural, and administrative boundaries to understand and address conservation issues in the United States and around the world.

Table C.1. Collaborative conservation competencies covered during multi-day training retreats at the start of each Cohort. X indicates inclusion; blank cells indicate the session was not offered. No record exists of training sessions for Cohort 1.

Cohort	1	2	3	4	5	6	7	8	No. of cohorts
Session covered:	2009	2010	2011	2012	2013	2014	2015	2016	
Situation Assessment		X	X	X	X	X	X	X	7
Building Partnerships		X	X	X	X	X	X	X	7
Collaborative Research		X	X	X	X	X	X	X	7
Communication & Storytelling		X	X	X	X	X	X	X	7
Cross-Cultural Learning		X	X	X	X	X	X	X	7
Collaborative Conservation Lessons		X		X	X	X	X	X	6
Facilitation Strategies		X	X			X	X	X	5
Conflict Management		X	X	X	X	X			5
Conservation Leadership		X	X	X	X				4
Site Visit			X	X	X	X			4
Defining Collaborative Conservation							X	X	2
Lessons from alumni				X	X				2
Participatory Evaluation				X	X	X			3
Fundraising		X		X					2
Systems Thinking		X							1
Project Evaluation								X	1
<b>No. Session per cohort</b>	unknown	11	9	12	11	10	8	9	

Tables C.2a-d. Respondent characteristics.

Table C.2a

	1	2	3	4	5	6	7	8 <sup>3</sup>	Unk	Total
<b>Cohort</b>										
Eligible Alumni	14	12	16	11	11	11	11	8	n/a	92 <sup>1</sup>
Interviews	6	4	5	4	3	3	4	2	0	30 <sup>2</sup>
Surveys	6	8	6	5	5	7	6	1	2	47
(% cohort)	(43%)	(67%)	(38%)	(45%)	(45%)	(64%)	(55%)	(11%)		(51%)

Table C.2b

		Survey respondents				Interviews
Fellow Discipline		Natural sciences	Both equally	Social sciences	Total (% eligible alumni)	
<b>Fellow Type</b>	Grad <sup>3</sup>	10	5	14	29 (58%)	16
	Faculty	3	3	2	8 (40%)	7
	Practitioner	4	5	1	10 (40%)	7
		17	13	17	47 (51%)	30

Table C.2c

<b>Continued collaborating</b>	
Yes	42 (89.4%)
Other (intermittently)	3 (6.4%)
No	2 (4.3%)

Table C.2d

<b>Continued working in conservation</b>	
Yes	45 (95.7%)
No	2 (4.3%)

<sup>1</sup> Two fellows participated in two cohorts, making cohort numbers sum to more than 92.

<sup>2</sup> Numbers sum to more than 30 because one fellow interviewed had participated in two cohorts.

<sup>3</sup> The first author was a graduate student fellow in cohort 8.

## Data collection instruments- Survey

### Lessons learned from 10 years of Collaborative Conservation Training

As the Center for Collaborative Conservation's Fellows Program hits the 10-year mark, we are embarking on a critical evaluation of the Program's goals and impacts regarding the fellows, conservation and community livelihoods. Thank you for providing valuable insight about the long-term impacts of your collaborative conservation training and experience with the CCC!

This survey should take about 10 minutes to complete. Participation is voluntary, and you may stop participating at any time. There are no known risks or direct personal benefits associated with your participation in this study. Results will be reported in aggregate in any publications or reports, with no personal identifiers. If you have questions about your rights as a participant in this research, contact the CSU IRB Administrator at (970) 491-1553 or by email at [RICRO\\_IRB@mail.colostate.edu](mailto:RICRO_IRB@mail.colostate.edu)

Click 'yes' below to indicate your willingness to participate and continue with the survey.

- Yes, take me to the survey (1)
- No, I do not wish to participate in the survey (2)

In this survey we use the following terms: Fellows Program - the CCC structure, including training retreat, meetings, social events, and funding. Fellows Project - the individual and team projects that the fellows completed, supported by the Fellows Program. Fellowship- your combined participation in both the Fellows Program and your personal Fellows Project.

The following questions ask about your CCC **Fellowship**.

Please indicate the Fellowship cohort that you were part of.

- Cohort 1 (2009-10) (1)
- Cohort 2 (2010-11) (2)
- Cohort 3 (2011-12) (3)
- Cohort 4 (2012-13) (4)
- Cohort 5 (2013-14) (5)
- Cohort 6 (2014-15) (6)
- Cohort 7 (2015-16) (7)
- Cohort 8 (2016-17) (8)
- I don't remember (9)

Please indicate whether you were part of a Team or Individual Fellowship.

- Team (1)
- Individual (2)

Please indicate your role in the Fellowship.

- Graduate Fellow (1)
- Faculty Fellow (2)
- Practitioner Fellow (3)
- Other (please describe) (4) \_\_\_\_\_

At the time of your Fellowship, which discipline did you identify with most?

- Natural sciences (e.g., wildlife biology, ecology, biodiversity conservation) (1)
- Social sciences (e.g., anthropology, human dimensions, livelihoods) (2)
- Both equally (3)
- Other (please describe) (4) \_\_\_\_\_

The following questions ask about you and your career.

Have you continued to work in a conservation-related field(s) since you participated in the Fellowship?

- Yes (1)
- No (2)
- Other (please describe) (3) \_\_\_\_\_

Have you continued to collaborate with local communities or other stakeholders since you participated in the Fellowship?

- Yes (1)
- No (2)
- Other (please describe) (3) \_\_\_\_\_

How important do you believe collaboration is for conservation?

- Extremely important (1)
- Very important (2)
- Moderately important (3)
- Somewhat important (4)
- Not at all important (5)

How important do you believe it is to integrate livelihood considerations into conservation?

- Extremely important (1)
- Very important (2)
- Moderately important (3)
- Somewhat important (4)
- Not at all important (5)

The following three questions ask how participation in the Fellowship **impacted you and your career.**

Please indicate how much you agree or disagree with the following 10 statements about the **impacts** of your **Fellows Project** experience (i.e., individual and team projects supported by the Fellows Program) on you and your career.

My experience in my Fellows project...

	Strongly Agree (1)	Agree (2)	Neither agree nor disagree (3)	Disagree (4)	Strongly Disagree (5)	N/A (6)
Has been useful to me professionally						
Provided insights that I have used frequently						
Provided a network that I have benefited from						
Made me more innovative						
Strengthened my leadership						
Improved my ability to work with a diversity of people						
Improved my ability to meet the needs of communities where I work						
Increased how much I integrate conservation considerations into my work						
Increased how much I integrate livelihood considerations into my work						
Increased the degree of collaboration in my work						

Please indicate how much you agree or disagree with the following 10 statements about the **impacts** of the **Fellows Program** (e.g., training, meetings, social events, and funding) on you and your career.

My participation in the Fellows Program...

	Strongly Agree (1)	Agree (2)	Neither agree nor disagree (3)	Disagree (4)	Strongly Disagree (5)	N/A (6)
Has been useful to me professionally						
Provided insights that I have used frequently						
Provided a network that I have benefited from						
Made me more innovative						
Strengthened my leadership						
Improved my ability to work with a diversity of people						
Improved my ability to meet the needs of communities where I work						
Increased how much I integrate conservation considerations into my work						
Increased how much I integrate livelihood considerations into my work						
Increased the degree of collaboration in my work						

In hindsight, how useful were the following **aspects of the Fellowship** (i.e., Fellows Program and Fellows Project) for you and your career?

	Extremely useful (1)	Very useful (2)	Moderately useful (3)	Somewhat useful (4)	Not at all useful (5)	N/A (6)	I don't remember (7)
Tools taught in Fellows Training retreat							
Teamwork time in Fellows Training retreat							
Being recognized as a CCC Fellow							
Networking with Fellows							
Monthly or quarterly Fellows meetings							
Lessons learned from other Fellows							
My Fellows Project							
Other (please describe)							

The following two questions ask about your use of the specific **Fellows Retreat modules**. Please answer as best as you can remember.

How useful have the following Fellows Retreat modules been to you and your career?

	Extremely useful (1)	Very useful (2)	Moderately useful (3)	Somewhat useful (4)	Not at all useful (5)	N/A (6)	I don't remember (7)
Partnership building							
Collaborative research							
Cross-cultural learning							
Situation assessment							
Facilitation strategies							
Conflict management							
Communication planning and engagement							
Leadership							
Participatory monitoring and evaluation							
Defining collaborative conservation							

Currently, how much of the Training Retreat modules **do you feel like you remember?**

	Remember most (2)	Remember half (3)	Remember little (4)	Don't remember at all (5)	N/A (6)
Partnership building					
Collaborative research					
Cross-cultural learning					
Situation assessment					
Facilitation strategies					
Conflict management					
Communication planning and engagement					
Leadership					
Participatory monitoring and evaluation					
Defining collaborative conservation					

The following two questions ask about the impact of the **Fellows Program** (e.g., trainings, meetings, social events & funding) on your **Fellows Project** (i.e., individual and team projects supported by the Fellows Program).

Please indicate how much you agree or disagree with the following statements about the impact of the Fellows Program on your **Fellows Project**.

My participation in the Fellows Program...

	Strongly Agree (1)	Agree (2)	Neither agree nor disagree (3)	Disagree (4)	Strongly Disagree (5)	N/A (6)	I don't remember (7)
Increased my integration of conservation considerations into my Fellows Project (1)							
Increased my integration of livelihood considerations into my Fellows Project (2)							
Increased my integration of collaboration into my Fellows Project (3)							
Made my contribution to the Fellows Project more innovative (4)							
Provided a network that I utilized for my Fellows Project (7)							
Improved my ability to work with a diversity of people in my Fellows Project (8)							
Strengthened my leadership of my Fellows Project (9)							
Improved my ability to meet the needs of communities where I conducted my Fellows Project (10)							

In hindsight, how useful were the various elements of the Fellows Program for your Fellows

Project outcomes?

	Extremely useful (1)	Very useful (2)	Moderately useful (3)	Somewhat useful (4)	Not at all useful (5)	N/A (6)	I don't remember (7)
Tools taught in Fellows Training retreat							
Teamwork time in Fellows Training retreat							
Fellowship funding							
Being recognized as a CCC Fellow							
CCC requirement to address conservation and livelihoods							
Networking with Fellows							
Monthly or quarterly Fellows meetings							
Lessons learned from other Fellows							
Other (please describe)							

The following questions ask about your **Fellows Project**. Please answer as best as you can remember. How collaborative was your Fellows Project?

- Extremely collaborative (1)
- Very collaborative (2)
- Moderately collaborative (3)
- Somewhat collaborative (4)
- Not at all collaborative (5)
- I don't remember (6)

How well integrated were conservation and livelihood considerations in your Fellows Project?

- Almost entirely livelihoods focused (1)
- More livelihoods than conservation (2)
- Equal integration of conservation and livelihoods (3)
- More conservation than livelihoods (4)
- Almost entirely conservation focused (5)
- I don't remember (6)

Please indicate how much you agree or disagree with the following statements.

Strongly Agree (1)	Agree (2)	Neither agree nor disagree (3)	Disagree (4)	Strongly Disagree (5)	N/A (6)	I don't remember (7)
--------------------------	--------------	--	-----------------	-----------------------------	------------	----------------------------

---

My Fellows Project helped build community capacity to deal with conservation issues

---

My Fellows Project was more relevant to the local community because it was collaborative

---

Did your Fellows Project continue after you left the project team?

- Yes (1)
- No (2)
- I don't know (3)

Please tell us who the primarily parties involved in the development of the Fellows Project goals were. (Check all that apply)

- Myself (1)
- Local community members (2)
- Other conservation workers (3)
- Other students or faculty (4)
- Other government workers (5)
- Other (please describe) (6) \_\_\_\_\_

Please indicate which, if any, boundaries you worked across during your Fellows Project. (Check all that apply)

- Administrative (1)
- Cultural (2)
- Disciplinary (3)
- Linguistic (4)
- Other (please describe) (5) \_\_\_\_\_

Is there anything else you would like to share about the CCC Fellowship?

## Data collection instruments- Semi-structured Interview Guide

We'd like to know whether the Fellowship has affected you professionally.

- (1) Can you tell me a little about what you do currently?
  - (a) Have you been involved with the CCC Fellows program at all since you participated? If so, how?
- (2) Have you incorporated any tools or insights from your Fellowship experience into your work since you were a Fellow? If so, what have those looked like?
  - (a) What aspects of the Fellowship provided those insights?
  - (b) Have those insights changed how you work or what you work on? If so, how?
    - (i) Do you feel like you've had greater impact in your work due to the Fellowship? If so, can you provide some examples?
    - (ii) Do you feel like the Fellowship impacted your leadership specifically? If so, how so?
- (3) Do you feel like your ability and/or willingness to engage in collaboration has been influenced by your experience in the Fellowship? If so, in what ways?
  - (a) Is how you collaborate differently from how you collaborated *before* the Fellowship?
  - (b) Were there aspects of the Fellowship (Fellow's project, training, etc.) that contributed to that change in your collaboration? If so, which ones?
- (4) Overall, what affects your decision whether to work collaboratively now?
  - (a) Is that different from *before* you did the Fellowship?
- (5) Do you feel collaboration is effective for your work?

- (a) Tell me more – in what ways does it work, in what ways does it not?
- (6) Can you tell me the reasons that you applied for and participated in the fellowship?
  - (a) Were those expectations met? How so? How not?
- (7) In hindsight, what would have been valuable to you that wasn't offered by the Fellows Program? What do you wish the Program had done that it didn't do?
- (8) Do you know how your project continued after you left? To your knowledge, what long-term impacts resulted from the project?
  - (a) Did you experience any challenges (that restricted your ability to) evaluating your impacts? What supports improved your ability to evaluate impact?
  - (b) Who was in charge of impact evaluation? How was impact evaluation sustained over the long-term?
- (9) Is there anything we haven't talked about yet that you think it's important we hear?

## FELLOWSHIP IMPACTS ON CAREER

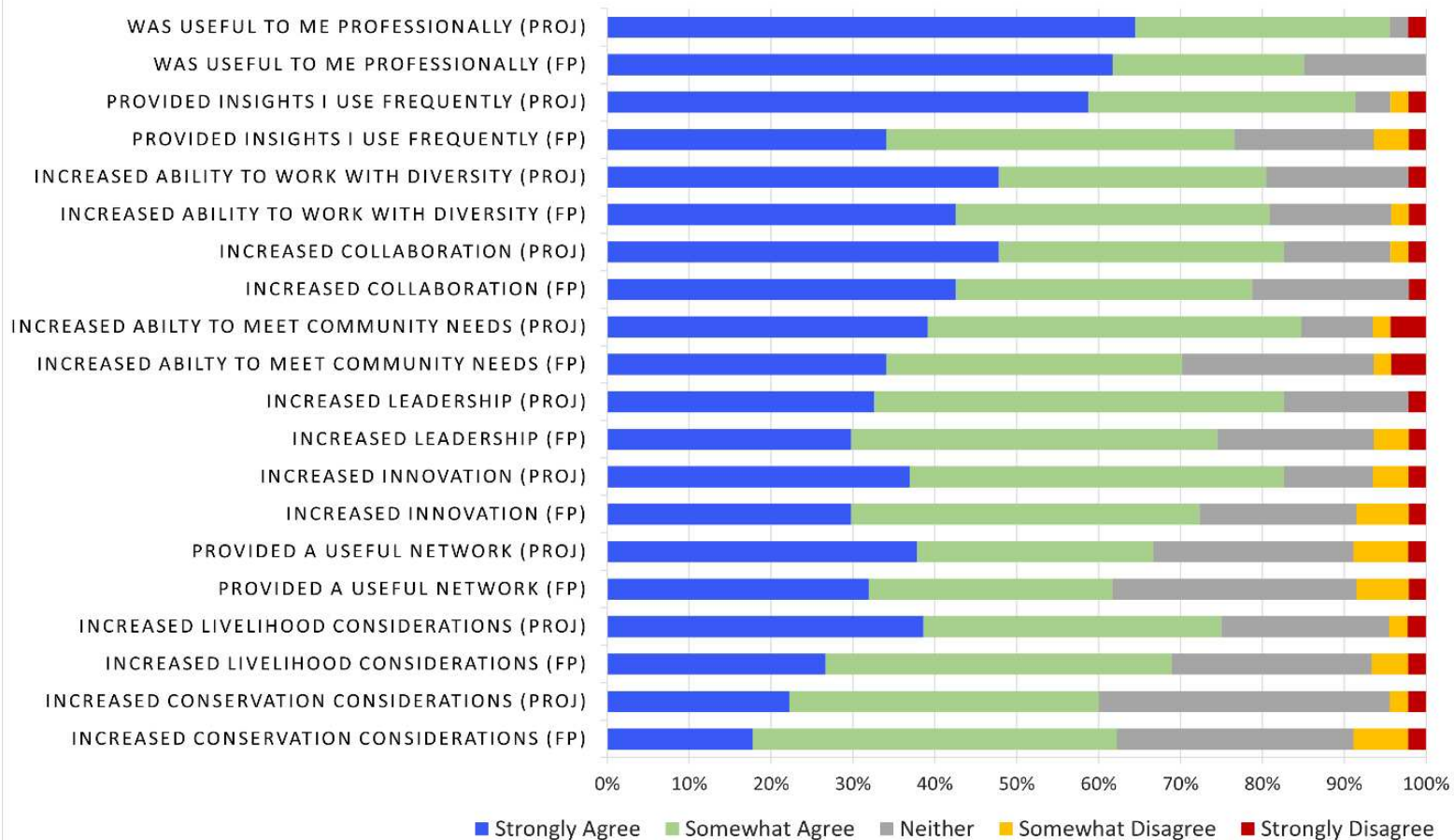


Figure C.1. Survey respondents' perceptions of career impacts stemming specifically from the fellows' projects (PROJ) and Fellows Program more generally (FP) (n=47) (from Table 4.1).

Table C.3 Additional illustrative quotes. Quotes support Theme 1: Transformation of practice and trajectories; Theme 2: Intermediary capacity dimensions of collaborative conservation; and Theme 3: Key programmatic inputs supporting capacity development.

	Sub-theme(s)	Illustrative Comments
Theme 1: Transformed practice	New trajectories	"[The fellowship] helped me move in the direction that I was really wanting to move... I have been able to enter into [my current] role because of... the experience at the CCC." (Fellow 29, faculty).
		"Without the fellowship... I wouldn't be what I am for the organization I work for now." (Fellow 18, practitioner)
	Enhanced practice	"I work to facilitate partnerships... every day, and the work that I learned through the CCC really set that foundation and set me up for this kind of career." (Fellow 26, graduate student)
		"I have really taken the general concept of collaborative conservation into my work today... That it's better to involve a lot of people up front: different groups, different stakeholders, different interests, even if it means that kind of work is harder and takes longer to see conservation results." (Fellow 11, practitioner)
	New identities	"Am I natural scientist or a social scientist? It's become really fluid, and I think that I'm not sure that would've happened actually without the CCC fellowship... That made a huge difference in why I was hired into the job." (Fellow 15, graduate student)
		"I feel that the CCC played a really essential role in shaping me as a conservationist." (Fellow 6, graduate student)
Theme 2: Intermediary capacity dimensions	Awareness	"Definitely in part through the CCC I got the message about how much I should be communicating about my findings and so that's been something I've made a big effort to do." (Fellow 15, graduate student)
		"That foundation that I had from the CCC in terms of developing relationships, establishing mutually reciprocal goals for projects, making sure that projects are meeting the needs of all of the partners that are involved, and that all of those partners are involved in the entire process, from the beginning." (Fellow 5, graduate student)
	Comfort	"I felt... like everyone there just believed in me, that I could do it, and then I did it and then I believed more in myself." (Fellow 15, graduate student).
		"It was a big boost to build confidence in myself as a researcher to have the fellowship. It came at a critical time, when I was wondering about my own career path and whether my research was worthy." (Fellow 4, graduate student)
	Conviction	"People [where I did my project] were really struggling [with drought] and surviving, and there was no way I was going to tell

		<p>them 'let's focus on saving wild animals' lives' when their own cows were dying." (Fellow 7)</p> <p>"Being really mindful that I wasn't just there to extract information from them... being open to them in a way that I'm not sure I would've been fully otherwise." (Fellow 15, graduate student)</p>
Theme 3: Key program inputs	Project	<p>"The other sort of real value was the project, in a really direct way, gave me the ability to focus in on something that I saw potential with and to learn, mostly about the system. There were some deliverables, but I learned a lot about the system that I then worked a lot on" (Fellow 29, faculty)</p>
		<p>"The CCC Fellowship allowed me to have that experience of collaborating [with] community members as my fellow researcher colleagues, even though we're from totally different cultures and totally different backgrounds." (Fellow 7, graduate student)</p>
	Funding	<p>[I applied for the] "money, money, money." (Fellow 24, faculty)</p>
	Community of practice	<p>"It wasn't until I came here and heard about the fellowship program that I started using collaboration as a way to organize the way I present my research... to think about the importance of collaboration." (Fellow 21, graduate student)</p>
<p>"And having an opportunity to work with people who really give [a darn] and care about this stuff...realistically you can't get squat done with a couple of thousand bucks. So I think the other piece of that is just recognizing 'Wow this group supports this thing, we've got something good here.'" (Fellow 18, practitioner)</p>		

Table C.4. Paired Sample T-test comparisons of mean impact of fellowship project v. Fellows Program on fellows' long-term collaborative conservation. Pair 1 calculated as means of 10 paired Likert items in Table 1 (left two columns)

Paired Sample		Statistics			Test
		n	Mean	SD	Sig.
Pair1	A. Mean long-term (career) impact attributed to Fellows Program	46	4.02 <sup>†</sup>	0.70	0.040*
	C. Mean long-term (career) impact attributed to fellows' projects	46	4.16	0.69	
Pair 2	A. Mean long-term (career) impact attributed to the Fellows Program	44	4.04	0.70	0.009*
	B. Mean short-term (fellow's project) impact attributed to Fellows Program	44	3.89	0.66	

Pair 2 calculated as means of 8 paired Likert items in Table 1 (right two columns)

Both measured on a scale of 1 (Strongly agree) to 5 (Strongly disagree).

(\*) Indicates significant at p-value < 0.05. Paired samples T-test indicated the mean of career changes (those in Table 1, columns 1&2) attributed to fellowship projects (M=4.16, SD=0.69) was higher than the mean attributed to the Fellows Program more broadly (M=4.02, SD=0.70), a statistically significant difference (t(45)=2.12, p=.040) (Pair 1). The mean of the Fellows Program's (long-term) influence on career (M=4.04, SD=0.70) was higher than its (short-term) influence on the fellowship projects (M=3.89, SD=0.66) (those in Table 1, columns 2&3), a statistically significant difference (t(43)=2.74, p=.009).

(†) ANOVA showed a marginally significant effect of fellow discipline on the mean impact of the Fellows Program on fellows' careers (Natural sciences, M= 3.67, Social sciences, M=4.18, Both equally, M=4.2) (F(2,44) = 3.25, p=.048, n2p=.13), but post hoc comparisons using Tukey HSD test returned no significant differences (p>.081).

(<sup>δ</sup>) ANOVA (at 0.050 significance level) returned no significant differences between fellow types (i.e., faculty, graduate student, practitioner) in Fellows Program mean long-term impact on career or mean short-term impact on fellowship projects; nor between fellow disciplines for the Fellows Program mean short-term impact on fellowship project

Table C.5. Comparison of fellowship component utility for short-term (fellowship project) and long-term (career) outcomes. All responses measured on a scale of 1 (Strongly disagree) to 5 (Strongly agree).

	n	Agree	Mean	SD	n	Agree	Mean	SD
Funding	na	-	-		45	88.9%	4.62 <sup>δ</sup>	0.75
My Project	47	87.2%	4.38	0.82	na	-	-	
Fellowship requirements	na	-	-		44	63.6%	3.84	0.96
Recognition as a CCC Fellow	47	53.2%	3.47	1.08	45	55.6%	3.60	1.23
Tools taught in training retreat*	44	52.3%	3.50	1.15	42	45.2%	3.31	1.24
Lessons learned from other fellows	42	45.5%	3.36	1.18	42	50.0%	3.48	1.15
Networking with fellows	45	48.9%	3.36 <sup>†</sup>	1.23	45	46.7%	3.36 <sup>†</sup>	1.35
Periodic meetings	39	35.0%	3.02	1.21	39	35.0%	3.02 <sup>†</sup>	1.16
Mean of fellowship components input	47	-	3.53	1.18	45	-	3.65	1.22
	...in fellows' careers				...in fellowship project			

(\*) Indicates significant difference between impact of fellowship component on fellows' long-term career and fellows' short-term project, based on Wilcoxon Signed Ranks Test ( $p < 0.050$ ).

(<sup>δ</sup>) Kruskal-Wallis 1-way ANOVA indicated fellow *type* (<sup>δ</sup>) significantly affected fellows' perceptions of funding utility for their fellowship projects ( $H(2)=9.03, p=.011$ ); Mann-Whitney post hoc tests indicated faculty ( $Mdn=4$ ) found funding significantly less useful than both graduate student ( $Mdn=5$ ) and practitioner fellows ( $Mdn=5$ ) ( $U=46.50, z=-2.68, p=.007$ ;  $U=15.00, z=-2.30, p=.021$ ; respectively).

(<sup>†</sup>) Fellows' *discipline* significantly affected fellows' perception that the network provided by the fellowship had helped fellows' careers ( $H(2)=12.39, p=.002$ ) or projects ( $H(2)=11.93, p=.003$ ), or that periodic meetings had helped their projects ( $H(2)=7.72, p=.021$ ). Mann-Whitney post hoc tests indicated that the network provided by the fellowship was perceived less useful for careers by those identifying with the natural sciences ( $Mdn=2.5$ ) than those in the social sciences ( $Mdn=4$ ) ( $U=40.00, z=-3.59, p<.001$ ). Those identifying with the natural sciences were also less likely than those in the social sciences to find networking ( $U=38.50, z=-3.64, p<.001$ ;  $Mdn=2$ ;  $Mdn=5$ , respectively), periodic meetings ( $U=41.00, z=-2.69, p=.007$ ; ( $Mdn=2$ ;  $Mdn=4$ , respectively) for their project outcomes.

Table C.6. Survey respondents' characterization of fellows' projects.

	n	Collaborative	Mean	SD
Degree of collaboration <sup>1</sup>	46	n/a	3.70	0.96
	n	Agree	Mean	SD
Was more relevant to the local community because it was collaborative <sup>2</sup>	46	73.9	4.00	0.97
Helped build community capacity to deal with conservation issues <sup>2</sup>	46	71.7	3.78	0.99

1 – on a scale of 1 (not collaborative at all) to 5 (extremely collaborative)

2 – on a scale of 1 (strongly disagree) to 5 (strongly agree)

## Supplemental Results

Differences Between Fellow Types & Disciplines, Kruskal-Wallis and Mann Whitney U Tests

Displayed in Table 1:

Kruskal-Wallis 1-way ANOVA indicated there were no statistically significant differences between *fellow types* on individual changes stemming from the fellowship projects or the Fellows Program; nor between fellow types on the Fellow Programs individual short-term fellowship projects (i.e., all three columns).

(†) Kruskal-Wallis 1-way ANOVA indicated *fellow discipline* (†) significantly affected fellows' perception that the fellowship project or the Fellows Program had changed the degree to which they integrated conservation into their work ( $H(2)=7.91, p=.019$ ;  $H(2)=7.90, p=.019$ , respectively); that a network valuable for their careers resulted from participation in the fellowship project and Fellows Program ( $H(2)=6.83, p=.033$ ;  $H(2)=8.35, p=.015$ , respectively) and that the Fellows Program had provided a network valuable to their fellowship projects ( $H(2)=11.32, p=.003$ ). Fellows' discipline also significantly affected fellows' perception that the Fellows Program had improved their ability to meet the needs of the communities where they work in their careers ( $H(2)=9.27, p=.010$ ).

Mann-Whitney U tests indicated natural sciences fellows ( $Mdn = 3$ ) were significantly less likely to feel the Fellows Program had provided a network which benefitted their careers than those in the social sciences ( $Mdn = 4.5$ ) ( $U=63.50, z=-2.93, p=.003$ ); less likely ( $Mdn = 3$ ) to find that the Fellows Program provided a network that benefitted their projects than either fellows identifying with the social sciences ( $Mdn = 4.5$ ) ( $U=42.00, z=-3.20, p=.001$ ) or as cross disciplinary

(*Mdn* = 4) ( $U=44.50$ ,  $z=-2.30$ ,  $p=.022$ ); and less likely (*Mdn* = 4) to find the fellowship projects provided a network that benefitted their career than either social science (*Mdn* =5) or cross disciplinary fellows (*Mdn* = 4) ( $U=71.50$ ,  $z=-2.23$ ,  $p=.026$ ;  $U=55.50$ ,  $z=-2.22$ ,  $p=.026$ ; respectively). Mann Whitney U tests indicated no significant differences between fellows identifying with the social science and those identifying as cross-disciplinary in these areas.

Fellows identifying with the natural sciences significantly were less likely than cross-disciplinary fellows to feel their fellowship project had increased their integration of conservation into their work (*Mdn* = 3, *Mdn* = 4, respectively) ( $U=55.50$ ,  $z=-2.28$ ,  $p=.022$ ), and less likely (*Mdn* = 3) to feel the Fellows Program had increased their integration of conservation into their work than both those identifying both with the social sciences (*Mdn* = 4) and cross-disciplines (*Mdn*= 4) ( $U=65.50$ ,  $z=-2.50$ ,  $p=.012$ ).

Fellows identifying with the natural sciences (*Mdn* = 3) were significantly less likely than both those identifying with the social sciences (*Mdn* = 4) and as cross disciplinary (*Mdn* = 5) to feel the Fellows Program had improved their ability to meet the needs of communities where they work in their careers ( $U=75.00$ ,  $z=-2.51$ ,  $p=.012$ ;  $U=51.50$ ,  $z=-2.58$ ,  $p=.010$ ).