MONITORING SCIENCE CO-PRODUCTION:

A TOOLKIT & PHILOSOPHY

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Contents

Expected audience: Who is this toolkit for?

This toolkit is intended to guide teams of researchers, resource managers, community members, and other regional experts who would like to evaluate their science co-production projects. What would a plan look like for assessing your collaborative efforts? What activities would need to be included in your proposal to demonstrate a commitment to monitoring and evaluation? Once funded and your project begins, this toolkit can help your team determine: How well are we doing? Where could we improve? What are we learning together? Beyond offering examples of specific instruments to gather information from participants, we also present a philosophy on why it matters to assess progress (together!). Furthermore, we point out challenges you may encounter upon the journey and potential strategies for navigation.

As social scientists (anthropologists)[1], we draw on 15 years of experience facilitating and studying collaborative community-university research projects in the Southeast USA. Whether bringing researchers and farmers together to co-develop climate-adaptation tools or convening government agencies and conservation organizations to conduct participatory modeling in agriculture and water management, we have worked with teams to reflect on their collaborative projects. Here, we offer insights based on our experiences and provide a few practical methods for documenting progress in the hopes of supporting teams to learn by doing.

This toolkit includes a series of data-gathering instruments such as workshop exit surveys, protocols for in-depth interviews and focus groups, and other approaches for checking in with project participants on their experiences. When these findings are integrated into planning with the help of facilitators, they offer opportunities for adapting processes according to emerging needs of the group. We present the toolkit as an adaptive framework that should be modified to fit the specific needs of your project. When designing your monitoring process, please pay close attention to the reasons behind the methods as well as potential red flags that we highlight.

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Note: For those beginning to learn about “science co-production,” we suggest a deep drive via these authors:

- Beier, Paul, et al. "A how-to guide for coproduction of actionable science." Conservation Letters 10.3 (2017): 288-296.
- Djenontin, Ida Nadia S., and Alison M. Meadow. "The art of co-production of knowledge in environmental sciences and management: lessons from international practice." Environmental management 61.6 (2018): 885-903.
- Reed, Mark S., and Hannah Rudman. "Re-thinking research impact: voice, context and power at the interface of science, policy and practice." Sustainability Science 18.2 (2023): 967-981.
- Vincent, Katharine, et al. "What can climate services learn from theory and practice of co-production?" Climate Services 12 (2018): 48-58.
- NOAA National Estuarine Research Reserve System Science Collaborative. 2022
- Stern, Marc J. Social science theory for environmental sustainability: A practical guide. Oxford University Press, 2018.

This toolkit does not include in-depth instruction and guidance on data management and analysis. Some considerations for analysis can be found in the section below titled quantitative and qualitative data. For those who want to dive deeper into analysis, numerous approaches, programs, manuals, and other texts are available to help researchers think through and prepare for data analysis.

- Laws, Sophie, et al. Research for development: A practical guide. Sage, 2013.
- Lester, J. N., Cho, Y., & Lochmiller, C. R. (2020). Learning to Do Qualitative Data Analysis: A Starting Point. Human Resource Development Review, 19(1), 94-106. https://doi.org/10.1177/1534484320903890
- Data analysis can be facilitated by using text management software packages (e.g. MAXQDA plus, or NVIVO) which assist in coding responses, creating memos, and recording emerging concepts or interactions among codes.

Definitions: What is Reflexive Monitoring (RM)?

Reflexive Monitoring (RM) provides a framework for teams to assess project organization and coordination, participant engagement around critical tasks, trust building, and overall satisfaction with outputs and processes. Unlike conventional program evaluation and monitoring that tends to happen at the end of the project, RM is ongoing and begins at the

outset of the project. In this way, results help teams "reflect" on the process and can therefore reveal opportunities and challenges as they emerge. The advantage of RM is that it "captures small successes and setbacks that might have been forgotten by the end of the project. These findings help refine workshop agendas and expand awareness across the network about expectations, change, and learning" (Bartels and Furman, 2023:331).

To ensure (and generate) a shared understanding of the full range of experiences within a co-production project, RM engages all members of the project including university researchers, resource managers, community members, government representatives, regional experts, etc. Everyone has unique vested interests in project outcomes. Therefore, data is gathered systematically from all participants (to the best of your ability) throughout the process.

Findings from RM can help teams to: 1) track how participants are experiencing being part of the project; 2) identify concerns and communicate novel ideas; and 3) guide project direction. By relaying results to project organizers and facilitators, RM helps to create a "structured iterative" approach to assessment that guides project adaptation. Furthermore, by sharing findings with project participants at the beginning but also throughout the project, the sense of community can be strengthened to enhance trust establishment and maintenance. For instance, the exercise of contemplating one's own experience and role as a participant (in relation to that of others) can help to establish both connection and purpose within and about the project.

Caution: Overwhelm, fatigue & keeping it real

Before diving into the specifics of RM, we wish to point out that RM is complex, messy, and iterative. It shifts back and forth from the minutia to macro patterns, offering many opportunities to learn together as a group. Yet, it is difficult (and maybe impossible) to do RM when you are not engaged over time with the same group. RM is about following participants' experiences as well as creating community and spaces for long-term dialog. Teams may choose to include new participants mid-term in the project. Thoughtfully planning how these individuals can be welcomed into the group and have their expertise integrated into the project will help maintain group cohesion. Due to the dynamism of projects, sometimes respondents might feel overwhelmed by the RM process (too many questions, another survey, or meeting reflection session). Be aware of and adapt your approach to the group's appetite for RM. You can build a culture for RM over time. Different phases of the project demand different paces. Collecting, analyzing, and sharing data requires a time commitment. Therefore, choices must be made regarding depth vs. breadth. You may be confronted with situations in which respondents reject surveys, or

when a facilitator lacks ability /capacity/willingness to process and integrate results. RM researchers may also experience a sense of drowning in data. Be aspirational and realistic. What is feasible? You are called to balance divergent project needs, such as doing the project, documenting the process, sharing results, and reflecting together to learn from the experience. There is time for these various aspects, but you may need to adjust expectations as you move through the project. Importantly: Do not let the "perfect" become the enemy of the "good."

Topics of interest

Group composition

Paying attention to group composition is critical at the beginning of the project. Even before the project initiates, we recommend obtaining external advice and guidance from other researchers and social scientists who have worked in communities of interest. To gather diverse feedback, investigate what types of groups or communities are most affected by the issue or questions at hand and who or what organizations might be predominant innovators in those communities. Strategies could include establishing an external selection committee and/or conducting your own needs assessment. Consider involving a range of experience and expertise areas as well as the inclusion of key demographic factors appropriate for your research (race, gender, class, geographic location, variable access to resources, etc.)

During early phases of projects, teams may find that their networks could benefit from additional, relevant voices. Use interviews and surveys to check in periodically throughout the process, asking if key voices or perspectives are missing or should be included at this stage. We suggest ongoing attention to group composition even as the project moves though the different phases of work. One way to think about the group you are convening is through the lens of data gathering. As with any investigation, the validity of results depends on the sources of data. If data is missing, for example, overall project results could be inaccurate or lacking an important element. Therefore, it is important to ensure that multiple viewpoints guide your co-production project. Not only will this help broaden the information needed for co-production, but it will also build trust in the process by demonstrating commitment to a more complete representation of the people and issues at hand.

Expectations

Expectations encompass what participants hope for from the process of engagement and project outcomes. Expectations can also include individual participant's strengths and anticipated roles in the project. Although a grant might clearly state project objectives and activities, each participant will have their own reason, motivation, and preference for how they engage. Therefore, gathering feedback about expectations and checking in periodically to assess if these expectations are being met helps project coordinators design engagement activities. In addition, as processes are modified to meet participant expectations, it also helps build trust and satisfaction. Sometimes, it becomes important to manage expectations and set boundaries on what the team can and cannot achieve considering the scope of the project. Having data to catalyze these reflections can support dialog. At project end, it is also enlightening to reflect with participants on expectations (outcomes and process) that they had identified at the onset of the project. Listing the expectations that were identified at the onset and discussing if they were met (and if not, why) can help build a sense of procedural satisfaction. Discussions can also reflect on (and celebrate) the many important roles that participants played in the project and the degree to which the co-production experience was fulfilling and valuable.

Satisfaction

Monitoring satisfaction often begins when collaborative tasks intensify, and results are interpreted. Findings related to expectations can complement a RM protocol around satisfaction to offer longer-term perspectives. Beyond exploring whether participants' tangible needs are being met, it is helpful to examine other aspects that can affect satisfaction. These include procedural and relational needs (Fig 1).

The "Triangle of Satisfaction" is useful for tracking the extent to which needs and interests are being met. Conflict management scholar Moore (1994) suggests that actors are most likely to walk away from a negotiation satisfied if all three sides of the triangle are satisfied.

- Substantive needs and interests include financial resources; responsibilities; information; timeframes; infrastructure, access/control of resources.
- Procedural needs and interests include mutually agreed upon partnership guidelines; a fair process; clearly understandable, timely and transparent steps; an opportunity for all parties to express their views.
- Psychological / Relational needs and interests include feeling trusted and respected; feeling heard; maintaining dignity; "saving face" to avoid embarrassment; feeling valued; not feeling blamed or scapegoated.

Arnold and Dain (2012), who adapted the tool for teaching conflict management skills in Natural Resources Leadership Institute (NRLI), observe that although it is rare to meet *all* the needs and interests of *all* participants, taking each group or individual into account will generally leave parties more satisfied with the results of a given set of interactions. Sometimes, even when substantive needs are not met, if people are treated with respect and perceive the process as transparent and fair, they may walk away satisfied. Conversely, conflicts may be exacerbated when people feel that one or more of their needs or interests have been unnecessarily sacrificed in pursuit of someone else's. In other words, it is important to move beyond substantive outcomes when monitoring satisfaction.

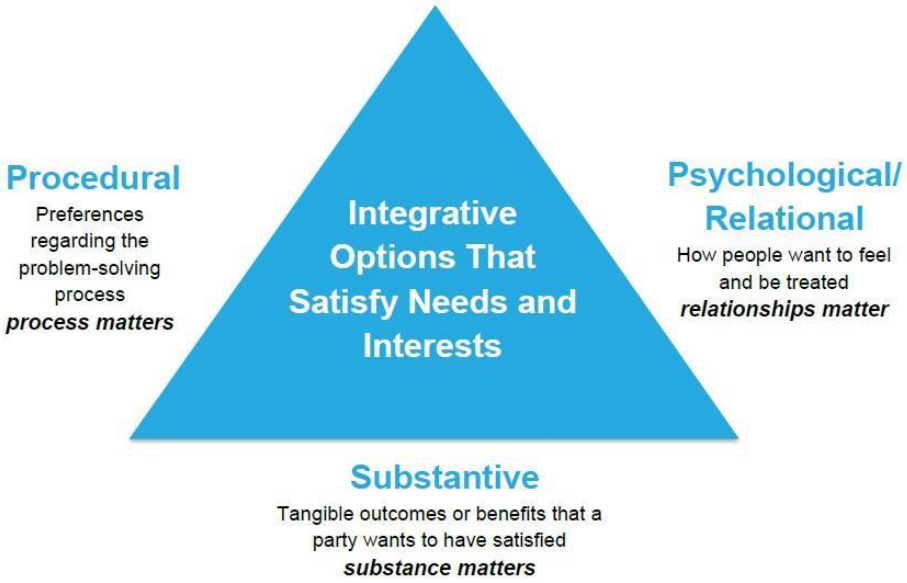

Figure 1: Three interdependent types of needs and interests should be carefully considered when planning, implementing, and monitoring co-production.

Involvement & influence

Supporting alignment on how participants can contribute to projects can help teams manage expectations, clarify roles, and enhance satisfaction. What are the key spaces for feedback and knowledge integration? Whose knowledge counts most, when? RM can track the degree to which participants perceive that they are able to influence project processes and outcomes.

It may also become helpful to generate awareness about (and track) how macro (and micro) contexts and dynamic situations affect participant engagement, interactions, and knowledge (e.g. policy changes, switches to virtual environments from face-to-face

engagement, navigating crunch times related to scheduling and output deadlines). We suggest documenting perceived barriers to the process of co-production. By facilitating group reflection about these findings, participants may identify strategies and opportunities for overcoming shortcomings or shifts. Even the simple act of openly acknowledging difficulties by naming them can help normalize change as a natural part of collaborative processes. Such discussions can help participants settle into circumstances that are inevitably unpredictable and messy.

Trust

Trust is a key variable to track across the life of the project. In RM, research into trust is used to examine the subtleties in how participants respond to the engagement process. When conducting research on trust, we acknowledge that it can be difficult to operationalize. As such, following the work of Colman and Stern (2018) we assess trust across multiple categories and argue that co-production projects benefit from a combination of different trust types: trust in products (rational), trust in people (rational and affinity), and trust in process (procedural). Rational trust is associated with perceptions of competence and one's confidence in the past performance of an individual, institution, or product. It forms when trustees perceive outcomes to be well executed (i.e., high quality and accuracy of data) and associated with relevant expertise. Affinitive trust is interpersonal, benefiting from social interaction and occurring when individuals develop a connection with one another. As such, this trust develops more easily among "like minded" participants and can be difficult to foster when convening groups with opposing perspectives. Procedural trust refers to trust in a system or set of procedures. Establishment of procedural trust occurs as well-designed and agreed upon processes are transparent and allow for modifications and adaptations to meet the needs and expectations of project participants. Participants gain procedural trust when involved early and often in projects. Maintaining trust diversity can buffer the group when one trust type is disturbed (see also: Bartels and Furman 2023).

Gathering information

A team approach that includes social scientists and a facilitator

Although a single individual can conduct RM for a project, we recommend a team approach. Fielke et al (2017) note in their article that an RM researcher can wear many hats in a project and often hold multiple perspectives in tension ranging from "appreciative" inquirer to "critical" assessor. As such, a team approach to data gathering allows for

internal analysis and helps each researcher maintain a narrower focus. How the RM research team is managed will depend on the background and interests of the individuals involved as well as capacity and resources (budget, time). We have found the benefit of a two-person team consisting of a focused researcher and a facilitator who both also work closely with other project coordinators. The RM team works together to co-develop research protocols and analyze results. One person executes data collection while the other focuses on collaborative data analysis and linkages to process design and facilitation. While RM can be conducted by different types of project team members, we recommend involving social scientists with experience in community engagement and qualitative research. Research with human subjects can be challenging and having a team or multiple team members familiar with this type of research will help to ensure it is a smoother process. Likewise, we recommend having a dedicated facilitator associated with the project as well. This individual does far more that keeping groups on task and people on time during project meetings. They contribute to assembling diverse participants into the project network. Furthermore, they design interactive spaces that ensure full participation, promote knowledge exchange and foster dialog for transformative problem-solving. Teams should identify internal candidates with appropriate skills and experience or hire an external facilitator (building this expense into the project budget).

Data and human subjects

As with other types of science, research with human subjects (as conducted in co-production) relies on the collection of data. Although data is something gathered and analyzed in many fields, when data is gathered from and about humans, the collection, storage, and analysis is filled with ethical considerations. Yet, we often don't ask ourselves, *What IS Data*? Data is derived from the Latin words, "datum" (thing given) and "dare" (to give). As such, all data derived from participant research are gifts given by individuals and/or communities in trust to researchers. Viewing data in this light reminds us that the information we receive is personal to those who offer it. Those of us who curate personal data, therefore, have a responsibility to the participants with whom we work to honor their stories and represent them with respect and dignity (McMullen et al 2023). What is more, the exchange of data ties gift giver and gift receiver to one another in a social contract of mutual respect.

The monitoring and implementation of science co-production is heavy with responsibility and necessitates thinking deeply about potential ethical factors. This toolkit does not define what ethical research is, nor does it prescribe specific guidelines or practices because each project is distinct in the make-up of the participants and institutions involved (see Methods reference recommendations for detailed overviews). In many cases, an institutional review board (IRB) assessment will be required. With or without an IRB

assessment, we highly recommend a deeper reflection of ethics by conducting a discussion of ethics with the entire project and mandating that (at least) those managing research with human subjects obtain a certification. Some things to consider are continued informed consent during the project; the anonymity of participants; fair and just processes defined by all those involved; the right of individuals to determine their level of participation; and a process that ensures confidentiality.

Qualitative and quantitative methods

The way in which teams choose to approach, organize, and analyze data varies greatly depending on the overall objective as well as time availability and skillsets of the researchers. We recommend including social scientists as key members of science co-production projects. Social scientists have experience navigating the complexities of groups and collaboration in general and can also offer expertise in data analysis.

The data gathering instruments in this toolkit contain a mixed method approach combining quantitative and qualitative questions. Each of these broad methodologies offers different ways to understand and interpret the experience of co-production. Quantitative methods are geared toward measurements (quantity), based in hypothesis testing that leads to generalizable knowledge. Quantitative questions have a specific answer that can be counted (e.g., yes, or no, a set choice of answers, or a rating). A quantitative question would ask, how many participants were satisfied with the workshop? This answer will tell us how many people reported they were satisfied compared to not satisfied, which is beneficial, but not the entire story. We also want to know why they were satisfied. Qualitative methods aim to capture experiences, beliefs, and motivations indicative of a specific individual or group of people. Qualitative questions are open-ended and allow the respondent to choose their own words and ways of expression (e.g., please tell me about…; describe your experience of…). A qualitative researcher may pose the following questions: Can you tell me about something you learned during the workshop today? Has that new idea helped you understand the system in a different way? These questions help us understand, for example, the value of attending the workshop for that individual. These data can then be compared to see if groups share similar perspectives. A mixed method approach can help paint a full picture of the experience of co-production. The quantitative data is black and white and provides the outlines of elements, helping formulate the boundaries of ideas. Qualitative data fills in color (and nuance).

Quantitative data analysis mainly involves descriptive statistics and can include basic data sorting and graph creation to show numeric or percentage totals. These data can then be

used to compare between subgroups or to derive general impressions related to specific activities. Qualitative data analysis involves the use of key quotes to deepen understandings and offer context. For example, if 65% of the group enjoyed the field trip, RM researchers would likely include a couple of quotes that describe how participants perceived that experience. Such description can be helpful for future planning.

RM researchers should take care not to let their own biases and desires for outcomes direct interpretation of findings. Qualitative data analysis can become especially complicated. For instance, sometimes qualitative questions are designed to capture reactions to specific experiences. In those cases, the wording of questions and assessment of subsequent responses will relate to those activities. Therefore, it is best that analysis of the findings is carried out by the person who designed the study and collected the data. Interpretation is enhanced when these analysts participate in the events that they are evaluating. Because neither tone of voice nor body language show up in interview transcripts, third party analysts risk missing the true meaning behind a quote or response. To help analyze qualitative data we also recommend using data organization or analysis tools. Tools can range from simple spreadsheets that simultaneously organize numerical but can also accommodate text responses to those that help analyze and code qualitative data.

Project phases & temporal considerations

When embarking on co-production initiatives, it can be helpful for teams to conceptualize discreet project phases. We envision projects following three phases: Community Building, followed by Knowledge Integration, and then Output Interpretation (Furman et al. 2018). However, we also recognize the critical importance of a "preparatory or scoping phase" during which project visioning and design takes place. Indeed, many NOOA projects assume four phases (to include preparation) for successful science co-production. Teams can demonstrate their deep commitment to co-production through collaborative proposal writing, which includes project researchers, resource managers, key community partners, and the RM team (social scientist and facilitator).

Although Figure 2 gives the illusion of linearity, the co-production process is somewhat iterative, usually complex, and likely messy. For instance, groups often appear to move three steps forward and then a couple back. Because project development is dynamic, RM teams should remain flexible in terms of how and when they collect data. RM is most successful with repeated, structured time for feedback, over time. Yet, projects are

dynamic and needs usually change over time. Therefore, RM protocols should be flexible enough to adapt and align with the emergent goals of the project.

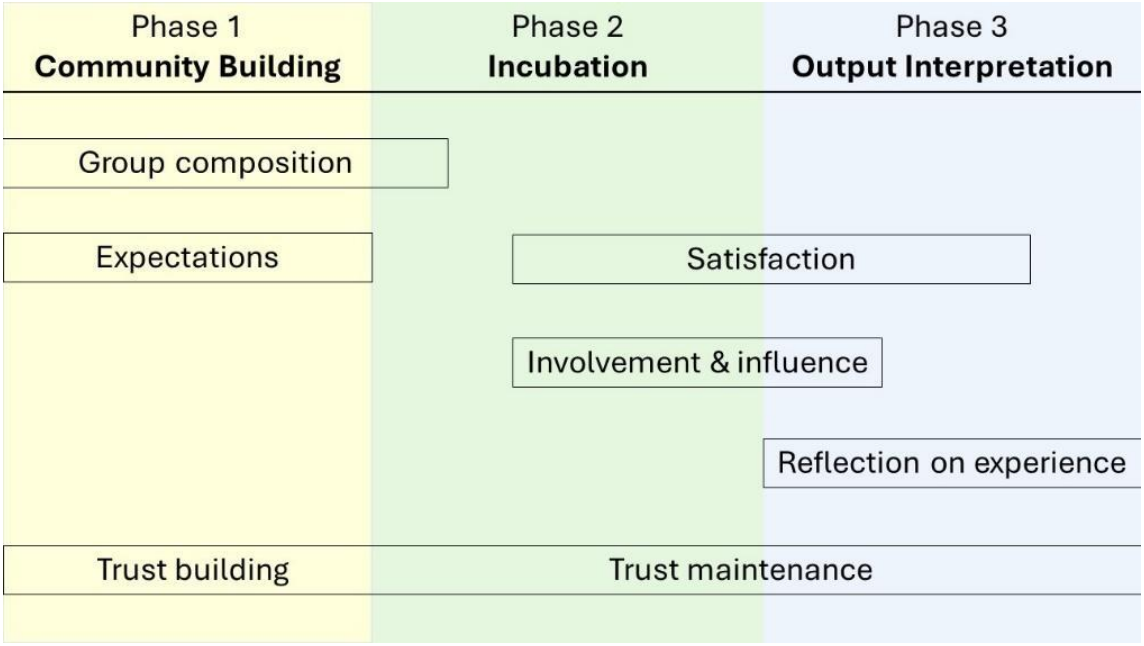

Figure 2. Phases of the project linked with instruments for data collection and topics of interests to emphasize dynamic temporal nature

Phase 1: Community Building

This phase refers to the beginning stages of the project (similar to NOAA's Design Phase) when participants are identified and initiated into the collaborative effort. Project participants begin to formulate their understanding of the project and their role while also forging (and unfortunately sometimes dismantling) relationships. During this time, facilitators or project coordinators aim to create a space for sharing ideas, expertise, and experiences. Activities that are designed to facilitate safe discussions in which listening is valued and where perspectives are heard and validated can help to build and strengthen trust. RM therefore focuses on methods and protocols that align with these goals. Data gathering strategies are mixed and can include:

- **Baseline Surveys:** Help to gain a general understanding of participants' background and experiences working in co-production; Offer a chance to gather lessons participants might have learned from past projects. Data are also later compared to a similar closing survey to see if/how participant perspectives of co-

production have changed.

- **Workshop Exit Surveys:** Administered after group interactions such as meetings and workshops. These can be administered on paper and then transcribed into a data management program or offered via an online platform. These data are scrubbed of individual identifiers and included in reports made available to the entire project. For ease and comparability, exit surveys follow a similar format and include a section that evaluates the workshop, comprehension of workshop content, and participation of self and others. Demographic questions are key to help identify if any patterns exist among different participatory groups. Caution: avoid exposing people's identity when using quotes and linking to a demographic category that is only represented by one or two participants (see data sharing red flag later in text).

- **In-depth Interviews:** Can be conducted in person, via phone, or virtual platform. At the community building phase, we recommend that every participant is afforded the opportunity to be interviewed. Although this method is very laborious for the RM researcher and time-consuming for the respondent, the data gathered and the experience itself is highly beneficial. During community building it is helpful to hear from participants, in an unstructured setting, about what their concerns might be, expectations for outcomes, what they feel they bring to the project community, as well as the types of support they might need to participate and be successful. These data can help inform the best path through which each participant could be engaged and can reveal red flags before they become issues. For the participant, this time to reflect on the project and consider their role and the roles of others, can help them situate their own experience and even prepare them for the work ahead. Questions pertain to expectations, trust, participation, and general feedback on the process. Interviews should be recorded with permission and transcribed.

- **Participant Observation:** Conducted during all aspects of the co-production process. The RM individual or each RM team member has their own notebook that contains observations gleaned from observing the various meetings and activities. These data are used to fill in gaps of understanding, help shape other research protocols, and are referred to when considering process adaptive management.

Phase 2: Incubation

Incubation is a research and development phase that marks the point where co-production begins in earnest. Participants actively and with some intensity integrate knowledge, creating shared language and understandings. This phase can overlap with the final aspects of community building. Lines blur and boundaries are permeable. During this phase, products and information are co-generated and co-assessed. This point in the process is labor demanding for all participants. It is also often a time of contestation and negotiation. As such, the safe spaces (hopefully) created in the community building phase are often tested. For instance, individuals or groups may overtly or covertly attempt to direct the process, hoping to steer outcomes in a specific direction. RM research during this phase is critical and must be conducted with a level of precision as participants are already overly burdened with other project activities. Groups may prefer a greater emphasis on surveys and participant observation as feedback methods in addition to the use of focus groups, which all require less time for the participants. RM research focuses on the experience of the participants, noting themes such as satisfaction, trust maintenance or rebuilding, cost and benefits of co-production, identification of barriers and benefits of co-production, and levels of power and/or influence on the process.

- **Exit Surveys:** are similar in form and structure as those conducted during Phase 1. However, additional questions can be added that include questions surrounding satisfaction, trust, and the experience of co-production. These latter themes will require the use of qualitative methods (questions and analysis) as we are seeking to understand a participant's experience. Although these types of questions can be hard to administer in a survey, the fact that the RM team has already broached these topics in a previous interview can mean that participants are somewhat prepared to answer them.

- **Focus Groups:** are an interactive discussion between a subset of the larger group (6-12 participants) that share a commonality (status, interest, background, demographic characteristic, etc.). RM researchers facilitate a discussion around a specific topic or theme. Although a specific goal and guiding questions are formulated, the discussion is open and allows participants to freely express their views as they agree or disagree with each other. Team RM research is key during a focus group because at least one member will facilitate discussion while the other takes notes. Notes are like those made during participant observation as the researcher focuses on how the participants respond to questions and each other as

well as on what they say (or don't say). Although some individual information can be gained in a focus group, findings primarily point to the experience of the subgroup. Therefore, it is important to define that subgroup strategically. In one of our projects, for instance, we created separate groups for modelers, other researchers, agricultural advisors, and participating community members. Once completed, data from all focus groups are compared and can illustrate how subgroups are experiencing satisfaction and trust within the project; where subgroups align and misalign; and how influence or power is playing out across the project.

- **Participant Observation:** is like Phase 1 and continues to be conducted during all aspects of the co-production process. Currently, the RM researcher focuses on the main topics of incubation, listening for shifts in trust, satisfaction as well as chronically the experience of co-production. Again, these data are used to fill in gaps of understanding, help shape other research protocols, and are referred to when considering process adaptive management.

Phase 3: Output Interpretation

Output interpretation is the final phase of the funded project and includes transfer and application of findings and products. Research themes such as satisfaction and trust continue during this phase. As the project focus changes (from looking forward to looking back) so too can individuals' feelings of connection to the project. Comparisons can be made between responses during the height of knowledge integration (the incubation phase) and those made when results are being interpreted and the project is heading to a close. For example, it can be helpful to ask participants to reflect on their experience during those difficult times of knowledge integration and compare their current responses to those they made earlier. Similarly, trust can ebb, and flow and should be tracked over time. Of specific importance during phase 3 is the opportunity for participants to not only reflect on their experience (was all this effort really worth it?) but to transfer that reflection to envisioning the future. As such RM research poses questions about lessons learned that help to bridge past experience into future directions. As with the other two phases, it is important to share findings gathered from RM with the group to maintain transparency and inclusion in the process.

- **Project End Surveys:** serve as a bookend to the baseline survey conducted at the beginning of the project. Many of the questions are repeated to allow for a

comparison with the first survey. However, some items may also be re-worded to capture reflections on and lessons learned after the project was completed. This exercise helps the RM team assess perceived experience of the project and gives the participant time and space to reflect on what the experience meant personally.

- **Exit Surveys:** are similar in form and structure to those conducted during Phases 1 and 2. Surveys will include quantitative and qualitative answer choices to evaluate the products co-created in the project in addition to those questions that focus on the specific experience of the particular workshop. If there is space and participants seem amenable, additional questions can be added that include topics surrounding trust maintenance, reflections on co-production, and overall experience of participating in co-production. These qualitative questions provide valuable data and can be especially helpful in shaping the final interview protocol. As with the exit surveys in Phase 2, the fact that the RM team has already broached these topics in a previous interview means that participants are somewhat prepared to answer them.

- **Final In-depth Interviews:** can be conducted in person, via phone, or virtual platform. At the end of the project, we recommend that every participant has the opportunity to be interviewed. This interview expands on the themes associated with the Project End Survey. However, as an interview it allows the participant space to elaborate and provide deeper feedback on the process and the experience. Participants should always have the option to share both positive and negative experiences, which inform next steps and future iterations of the project. Themes include trust moving forward and lessons learned. Respondents may be asked to revisit their expectations from the beginning of the project and consider if these hopes were met and if they remained relevant until the end. Trust is centered around the themes of people, process, and products but is now forward looking wherein participants consider how this trust shapes the way project deliverables will be used and discussed in the future. Lessons learned is a tangible discussion that brings to light moments where the project encountered rough patches. Insights can provide guidance for future project design with this group or among new groups.

- **Participant Observation:** is like Phases 1 and 2, conducted during all aspects of the co-production process. Currently, the RM researcher focuses on reflection: benefits of co-production, final assessments of the products, discussions on future projects, or uses of co-production materials, and next steps. RM researchers listen

for shifts in trust, satisfaction as well as the experience of co-production. Again, these data are used to fill in gaps of understanding, shape other research protocols, and are referred to when considering process management and next steps.

Red flags & nuanced strategies

Data sharing & confidentiality

The timely presentation of findings back to respondents can build credibility in the process. Avoid extractive RM data collection situations in which project participants rarely see results. Formats and moments for sharing findings can range from reports and presentations to posters at project meetings, webinars or other gatherings. Facilitators may request more detailed information to generate ideas on how to foster strategic dialog with the broader group. Sensitivity is needed to prevent public shaming. Always remember to *separate the people from the problem* (i.e., do not personalize issues, but rather generalize up to the challenge instead of focusing on the specific individuals involved).

A human subjects IRB protocol is an important aspect to consider when sharing findings, and it can also help you think through how you will share data. IRB is specifically important if you would like to publish any of your results. Even without a formal procedure (though we recommend going through a process regardless of mandate), informed consent is key to RM success.

One aspect of RM that cannot be overstated is the danger of revealing respondents' identities when sharing data with larger groups. Once people feel exposed, they will be reticent to offer more feedback and trust can be eroded. Therefore, protecting identity is critical. Raw data should never be emailed or shared from person to person. The RM researcher should anonymize all data that leaves his/her computer. This is true for both quantitative and qualitative data. Furthermore, when using direct quotes be sure that they cannot be tied easily to a specific individual. In that case, paraphrase.

Tension about quantity vs. quality

Be aware of biases toward quantified findings and the tendency to dismiss individual experiences as "anecdotal evidence." Does one person's opinion matter? Yes. Even if most people in a group are happy and only one or two people are upset, RM is interested in the stories of those outliers. Consider the consequences of ignoring a disgruntled participant . Clearly, you will have to make trade-offs between catering to specific

individuals and being true to a larger group. We suggest that teams generate a respect for qualitative data.

Threats to power & transparency

Questioning how things are going is bound to ruffle feathers along the way. By revealing what is working, and especially what is not going so well, you can expect to rock the boat (or many little boats). Despite all the efforts you might take to be sensitive in framing results, it is wise to be prepared for resistance. Some realities are difficult for project participants to accept. Some findings will likely threaten assumptions and power dynamics. We have found it helpful to prepare groups from the outset for the journey of RM. Be transparent about why data is being collected, who will process the raw data, and how findings will be shared. Seek consensus from participants at the beginning of projects on their willingness to engage in RM. Discuss the value of the process (as well as risks). Invite participants on a voyage of discovery. Elevate curiosity and emphasize the gains for team learning and improvement. When sharing findings, it is important to frame messages constructively and tailored to different audiences. Public shaming that exposes groups or individuals is detrimental to trust building. Sometimes, even facilitators can be sensitive to hearing results, especially if participants report not feeling heard or dissatisfaction with workshop structures. If PIs are facilitators, the situation can become even more complex. We found that the timing of feedback matters. For instance, having the capacity (bandwidth) to receive results is critical to thoughtful processing. Furthermore: Relationships matter. We recommend checking-in with your team on how the RM process is going for them. A healthy process demands flexible, forgiving attitudes, cultivating an openness to self-critique, transparency, and a spirit of co-learning.

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Appendices

The appendices are organized into two sections. First, we offer general questions arranged by topic area and suggest timing of implementation according to project phase. We then provide a series of example instruments that can be adapted to project needs.

Appendix A: General research questions

Below is a list of research questions organized by topic area. These questions can be used in interviews or surveys depending on the need and phase of the project. In some cases, questions can be repeated. Other questions are linked to a specific phase (i.e. community building, incubation, or output interpretation).

Group Composition

Phase 1, Phase 2

- Are all the right people engaged in our project?
- Are we missing any critical perspectives in our discussions?
- What additional (if any) topic or person (area of expertise) should we add to this network?

Expectations

Phase 1

- Can you tell me the story of how and why you became involved with [insert project].
- What do you bring to this group? Why are you part of the group?
- What do you hope to get out of your participation / accomplish because of your participation in the project?

Phase 3

- When we look back at the project proposal and early input on expectations, we had several goals in mind. We'd like to assess whether you think we achieved them [insert Goal or Stated Expectation]
    a) Did we achieve this goal/expectation? Y/N/unsure
    b) If yes: How so? Can you tell me more about that or offer an example?
- What do you think we achieved overall in this project? How are these outcomes of value to your work?

Satisfaction

As you plan (and monitor) collaborative activities, ask yourself:

- Do I know what each participant wants out of this discussion, decision, or partnership and why? (substantive needs)
- Do I know how participants want to interact with the management, research, and facilitation team? What process would they prefer (or not prefer) to be used for communicating, engaging, interacting? (procedural needs)
- Do I know how participants feel about the other individuals involved in the issue? Have I really listened - do those involved feel heard? How can we best show respect? Are we inadvertently using "blaming" language or names/terms/descriptions that, to others, convey arrogance or disparagement? Are we ignoring or marginalizing anyone? Are we remaining cognizant of cultural or power differences that may cause our actions to be misinterpreted? (relational/psychological needs)

Phase 1

- Satisfaction with the process: To what degree do you feel your concerns and suggestions are being integrated into the process of co-generating and refining [insert goal of the project]?
    - Excellent; Good; Average; Poor; Terrible (select one choice)
    - Can you elaborate on your choice above? (open-ended text box)

Phase 2

- How involved were you in the process of choosing/developing [insert product]?
    - Response option choices: Very involved, I attended most meetings and provided input; Moderately involved, I attended some of the meetings; Not involved, I did not attend meetings nor provide input
    - Can you elaborate on your response?
- How satisfied are you in the [insert product] that has been chosen?
    - Response option choices: Very satisfied; Somewhat satisfied; Somewhat dissatisfied; Very dissatisfied; I am not sure yet
    - Can you elaborate on your response?

- Considering how you engaged with [insert activity to develop a product], rate your satisfaction in the process: (i.e., your ability to contribute and be heard, your ability to process information, did we have the right people in the room).
    - Response option choices: Very satisfied; Somewhat satisfied; Somewhat dissatisfied; Very dissatisfied; I am not sure how to answer this question (5)
    - Can you elaborate on your response?

- How satisfied are you with the way you were treated by the group during the process (i.e., were your views respected and given appropriate consideration. Were you: trusted, respected, and valued)?
    - Response option choices: Very satisfied; Somewhat satisfied; Somewhat dissatisfied; Very dissatisfied; I am not sure how to answer this question
    - Can you elaborate on your response?

Throughout the project

- To what degree do you feel that *your perspectives* were taken into account during this workshop/event? (Offer response option choices)

- To what degree do you feel the perspectives of *other participants* were taken into account during this workshop/event? (Offer response option choices)

Involvement & Influence

Phase 2

- As a modeler / Extension agent / [insert role here] - where do you think your power is to influence the outcome of the project?
- Please identify the ways you were able to contribute most to the project.
- Were there moments in which you wish you had had more influence?
- At what point do you think you were unable to influence the process and how might that have affected the outcome?

Phase 3

- During the focus group, participants were asked to list benefits and barriers of co-production. Offer the compiled list. Ask participants:
    - During our focus group discussions, participants were asked to provide examples of situations when they experienced a benefit to co-production. Please rank the following benefits to co-production in order from MOST Beneficial to LEAST Beneficial"
    - During our focus group discussion participants were asked to provide examples of barriers to co-production. Please rank the following list of barriers to co-production in order from the MOST significant barrier to co-production to the LEAST significant barrier to co-production"
- Considering the costs and the benefits, would you say [insert co-production activity participatory modeling, tool development, etc.] done in this way is worth it?
    a) Y/N/Unsure.
    b) Would you do it again? Y/N/Unsure.
    c) What piece of advice would you offer a team embarking on a similar project?

Trust

Phase 2

- Are there specific people (or types of people) within the group who you go to for clarity or deeper information? Has this changed since we began the project?
- Where do you see gaps in either the process or results thus far? What is missing?
- Consider a moment of disagreement during the [insert activity]? Did that experience affect your level of confidence in the people, process or results? IF so, how?

Throughout the project

- **People: Trust in Project Coordinators/Scientists/Researchers**
    - On a scale of 1-5 (1 being least confident and 5 having the highest level of trust and confidence), what is your current trust in (the knowledge base/expertise of) the Project Coordinators and Scientists/Researchers?
    - Can you discuss the reason for this answer/elaborate on this answer?
    - On a scale of 1-5; how well do you think the Project Team is integrating (stakeholder) input?
    - Can you discuss the reason for this answer/elaborate on this answer?

- **People: Trust in Community Members/Stakeholders**
    - On a scale of 1-5, what is your current confidence in (the knowledge base/expertise of) the stakeholders?
    - Can you discuss the reason for this answer/elaborate on this answer?

- **Process and Products: Trust in what is being produced and how**
    - Thinking back on [development of a project deliverable]... on a scale of 1-5, how confident are you in...
        - The process that led to the results presented
        - Can you discuss the reason for this answer/elaborate on this answer?
        - The results (themselves) that were presented
        - Can you discuss the reason for this answer/elaborate on this answer?

Appendix B: Sample instruments

Appendix B1: Baseline survey

This Baseline survey aims to gain a general understanding of participants' backgrounds, experiences with co-production, expectations concerning community/stakeholder engagement and also offers a chance to gather lessons participants might have learned from past experiences. Later, data are compared to a similar closing survey to see if/how participant experiences of co-production have changed. The survey is best administered through an online survey tool. Information from this survey can be compared to a closing survey similar in form to determine if ideas about co-production changed during or because of the project experience.

Survey Introduction

-Inclusion of IRB protocol and aims of the survey

1) Have you in the past been involved in a project that brought the expertise of scientists/researchers/resource managers and stakeholders together? (Yes, No)

2) Draw on your experiences with these past projects. List **three key** aspects of that experience that made it *successful*.

3) Drawing on your experiences with past projects. List **three key** aspects of that experience that made it *unsuccessful*.

4) Based on these previous experiences, which conditions or strategies seem to favor success?

5) Which research-related activities do you think stakeholders should be involved with – ideally?

	Role	YES	NO	Not Sure
i	Identifying the problem			
ii	Developing research questions			
iii	Developing study methods			
iv	Writing funding proposals			
v	Providing data to researchers			
vi	Collecting data			
vii	Interpreting results			
viii	Disseminating information			
ix	Developing solutions and/or policy			

6) When you hear the term “co-production” what 3 words come to mind?

7) Have you been involved in a co-production project before? (Yes, No)

8) Can you explain in a sentence or two what that project was?

9) Using the scale below; rate the following statements about that project.

	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)	I am not sure (5)
Project goals were met (1)					
Project outputs were flexible and able to incorporate input from participants (3)					
The data used was trusted by group participants (2)					
The process of developing outputs was contentious (4)					
The process of interpreting results was contentious (6)					
Emerging conflict was resolved during discussions (5)					

10) Would you like to expand upon any of the above responses?

11) Given your experiences, did you benefit from being a part of a co-production project? (Yes, No) - If Yes, How?

12) Were there costs to engaging in the co-production project? (Yes, No) If yes, what were they?

13) Considering your experiences with co-production, do the benefits (if you indicated any) outweigh the costs of engagement?

14) On a scale of 1-5; How confident are you that [insert your project] will succeed in [state goals].

	Not confident (1)	Somewhat unconfident (2)	Somewhat confident (4)	Very confident (5)
[Insert Goal #1] (1)				
[Insert Goal #2] (2)				

15) *You may want to insert a question that aims to find out how familiar participants are with the project goals and types of work that will be done. For example, we asked questions concerning participant familiarization with models and modeling to determine how much training may be needed.*

Demographic information: This will be specific to your project team and participants

16) Specialization/Region/ (Check all that apply)
17) Do you have a science background (formal or informal training)? (Yes, No)
18) Name (answers will be coded to protect your identity)
19) Did we miss something important? Do you have something you want to share or ask us?

Appendix B2: Final/closing survey

This Final survey aims to understand if the process of co-production was worthwhile and whether it changed participants' views on the value of co-production. Data can be compared to the baseline survey. The survey is best administered through an online survey tool. These questions could be asked as part of the final interview; however it is easier to complete them on a survey form.

Survey Introduction

-Inclusion of IRB protocol and aims of the survey

1) Draw on your experiences with [insert project]. List **three key** aspects of that experience that made it *successful*.

2) Drawing on your experiences with [insert project]. List **three key** aspects of that experience that made it *unsuccessful*.

3) Based on your experience with this project, list conditions or strategies that seem to favor success?

4) Which research-related activities do you think stakeholders should be involved with – ideally?

	Role	YES	NO	Not Sure
i	Identifying the problem			
ii	Developing research questions			
iii	Developing study methods			
iv	Writing funding proposals			
v	Providing data to researchers			
vi	Collecting data			
vii	Interpreting results			
viii	Disseminating information			
ix	Developing solutions and/or policy			

5) When you hear the term “co-production” what 3 words come to mind?

6) Using the scale below; Rate the following statements about [insert project name]

	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)	I am not sure (5)
Project goals were met (1)					
Project outputs were flexible and able to incorporate input from participants (3)					
The data used was trusted by group participants (2)					
The process of developing outputs was contentious (4)					
The process of interpreting results was contentious (6)					
Emerging conflict was resolved during discussions (5)					

7) Would you like to expand upon any of the above responses?

8) Given your experiences, did you benefit from being a part of [Insert project]? (Yes, No)

   If Yes, How?

9) Were there costs to engaging in the co-production project? (Yes, No)

   If yes, what were they?

10) Considering your experiences with co-production, do the benefits (if you indicated any) outweigh the costs of engagement?

11) Name (answers will be coded to protect your identity)

12) Did we miss something important? Do you have something you want to share or ask us?

Appendix B3: Workshop/meeting exit surveys

Surveys in general are more quantitative in nature but can have qualitative components to fill in information. Although the example below is an Exit Survey you can also send out surveys anytime during the project as a way of checking in or "taking the temperature" of the group. Use the sample questions under the different topics in section A.1 to add to surveys. As with other instruments, surveys have a specific structure: 1) IRB statement and agreement; 2) warm-up question(s); 3) questions that relate to the goals of the survey; 4) demographic questions and closing.

Exit surveys are administered at the end of each workshop. It is given out during the closing portion of the workshop and responses are written by each of the participants. The responses are then put into an excel sheet from which charts are made. Qualitative data are transcribed. These data are then added to the final workshop reports available to participants. Exit surveys follow a similar format and include a section that evaluates the workshop, comprehension of workshop content, and participation of self and network. Questions from A.1 can be added to Exit Surveys when appropriate. Demographic questions are key to help identify if any patterns exist among different participatory groups.

Sample Exit Survey

[Insert Project Name]
EXIT SURVEY- <u>WORKSHOP [#]</u>

The Project Team truly values input from participants on workshop activities.
We use your feedback to make changes and improvements to the project and workshops.

1. **Can you share something that you found surprising, particularly interesting or that you specifically enjoyed during the workshop?**

2. **To what degree did we achieve our stated objectives for this workshop:**	**Poor**	**Fair**	**Satisfactory**	**Good**	**Excellent**	**Don't know**
Objective #1	1	2	3	4	5	6
Objective #2	1	2	3	4	5	6
Continue with all Objectives	1	2	3	4	5	6

3. **Was there enough time and space for networking with participants?** (Circle one)
   YES / NO If not, please offer suggestions for next time

4. **Evaluate the following aspects of the workshop on a scale of 1-5**	**Poor**	**Fair**	**Satisfactory**	**Good**	**Excellent**	**Don't know**
Effectiveness of meeting structure	1	2	3	4	5	6
Use of time	1	2	3	4	5	6
Effort to engage all participants	1	2	3	4	5	6
Clarity of next steps	1	2	3	4	5	6
Clarity of technical ideas presented	1	2	3	4	5	6

5. On a scale of 1-5:	**Poor**	**Fair**	**Satisfactory**	**Good**	**Excellent**	**Don't know**
a. To what degree do you feel that *<u>your perspectives</u>* were taken into account during this workshop	1	2	3	4	5	6
Can you expand upon your response above?						
b. To what degree do you feel the perspectives of *<u>other workshop participants</u>* were taken into account during this workshop	1	2	3	4	5	6
Can you expand upon your response above?						
c. How would you rate your <u>current</u> <u>understanding</u> of [insert topic]?	1	2	3	4	5	6
Can you expand upon your response above?						

6. **Reflecting on [add event or topic that occurred or was discussed], how satisfied are you that your ideas were carefully considered? (underline one)**

   Very satisfied Somewhat satisfied Neither satisfied nor dissatisfied
   Somewhat dissatisfied Very dissatisfied

7. **Is there anything in particular that we need to follow up on and discuss in more detail?**

8. **Do you have anything else you would like to tell us? Is there something you would like to see at the next workshop?**

9. **Circle your [state/region other important demographic]:**

10. **Circle one (or more) of the following, that best represents your <u>professional background</u>:**

Appendix B4: In-depth interviews

In-depth interviews can be conducted in person, via phone, or virtual platform. While this method is very laborious for the researcher and time-consuming for the participant, the data gathered and the experience itself is highly beneficial. To reduce fatigue, we used both quantitative and qualitative type questions in an interview (avoiding sending out a follow-up survey).

Interview 1 is an example of questions and flow of an in-depth interview that would be conducted at the beginning of the project's *Community Building Phase*. Interview 2 is an example of questions and flow of an interview conducted at the end of the project during *Output and Interpretation Phase*. Interviews can be conducted during the incubation phase, but consider bandwidth because collaboration tends to be more intense during that time and respondents may be fatigued by additional project-related expectations for interaction. You can reuse questions so that ideas can be compared overtime OR you can use modified questions from surveys to get a deeper understanding of participant experiences and expectations.

INTERVIEW 1

Interview goals

- How did participants get incorporated into the project. The role they have (think they have) at this point and expectations. Initial evaluation of trust
- Integrating participant experience and ideas into initial process and planning.

Review IRB protocol with participant

Warming up to the conversation

Thinking back to the last workshop, can you describe a moment, conversation, activity that stuck out in your memory?

Expectations and Roles

1) Why do you think you were asked to be on a part of [Insert project]. What is your history with the development of this project?
2) Can you tell me the story of why you are involved with [insert project].
   a) What do you contribute to the project? What do you bring to this group? Why are you part of the group?

b) What do you hope to get out of your participation/accomplish because of your participation in the project?
   - What aspect of the project is most interesting/important to you?
   - What aspect of the project is most interesting/important to your work or community?

Trust: Confidence in the people, process, and project outcomes/products

3) People: Trust in Project Coordinators/Scientists/Researchers

   a) On a scale of 1-5 (1 being least confident and 5 having the highest level of trust and confidence), what is your current trust in the Project Coordinators and Scientists/Researchers?
      - Can you discuss the reason for this answer/elaborate on this answer?

   b) On a scale of 1-5; how well do you think the Project Team members/Researchers are integrating (stakeholder) input?
      - Can you discuss the reason for this answer/elaborate on this answer?

4) People: Trust in Community Members/Participants/Resource Managers

   a) On a scale of 1-5, what is your current confidence in the stakeholders?
      - Can you discuss the reason for this answer/elaborate on this answer?

5) Process and Products: Trust in what is being produced and how

   a) Thinking back on [development of a project deliverable]... on a scale of 1-5, how confident are you in...
      - The process that led to the results presented
        (1) Can you discuss the reason for this answer/elaborate on this answer?
      - The results (themselves) that were presented
        (1) Can you discuss the reason for this answer/elaborate on this answer?

Participation and Feedback

6) Were you part of the development of [insert key activity]? Y/N
   a) Could you describe the steps of how/when you participated (in webinars, other meetings etc.)?
   b) In your view, was it a valuable investment of time? Why? What were the key outcomes?
   c) Was there anything that you wanted included? Did you raise issues that you wanted to see incorporated.
   d) How satisfied are you with the current products?

e) Were all the right people engaged in these discussions?

Community: Communication, Relationship building, and Networking

7) Are there specific people (or types of people) within the group that you go to for clarity or deeper information?
   a) Has this changed since we began the project?

8) Are there specific people (or types of people) within the group that you would like to connect with (maybe for clarity or deeper information), but don't feel comfortable reaching out to?
   a) Has this changed since we began the project?
   b) How can we better facilitate communication (answers to questions, information, etc.) for you?
   c) What would work well for you? (considering time management)

These questions are for Project Coordinators and Scientists/Researchers

9) Consider a situation when you needed information or input from a stakeholder, what was your preference for how that connection should be made or initiated?

10) Consider a situation when you received input, what part of the input was valuable, what was missing?

11) How has this input related to your goals in the project?

Closing questions

12) Can you describe something that was surprising- what did you next expect to see at this point in the project?

13) Where do you see gaps in either the process or results thus far? What is missing?

14) Anything else we should know or consider moving forward?

INTERVIEW 2

Interview goals

- What was the experience of being a part of the project? How do current outputs and products align with participant expectations? Final evaluation of trust
- What are the desired next steps for this project?

Review IRB protocol with participant

Warming up:

Can you describe a favorite memory or event associated with this project?

Outputs and Personal Expectations

1) What do you think we achieved in this project?

2) How are these outcomes of value to your work?

3) Will this project live on in your work or in your institution? Yes/No
   a) How so? (Is there utility to the outcomes / methods or network beyond project closure?)

4) Overall, would you say that your expectations were met in [insert the name of your project here]? Y/N/Unsure
   a) How so?

5) Were you disappointed in any way?

Expectations Compared

You gathered a list of expectations during the first interview and potentially during Surveys. Compile a list of those expectations and ask which of these were met, which were not, and if they are still important to this participant.

6) When we look back at the project proposal and early input on expectations, we had several goals in mind. We'd like to assess whether you think we achieved them.

[Goal or Stated Expectation]

a) Did we achieve this goal/expectation? Y/N/unsure
   - If yes: How so? Can you tell me more about that or offer an example?
   - If no: Was that an important goal? How did not achieving this goal impact the project?

Repeat with other goals

Trust: Confidence in the people, process, and outcomes/products

7) People: Trust in Project Coordinators/Scientists/Researchers

a) On a scale of 1-5 (1 being least confident and 5 having the highest level of trust and confidence), what is your current trust in the Project Coordinators and Scientists/Researchers?
    i) Can you discuss the reason for this answer/elaborate on this answer?
    ii) Has your level of trust changed since the beginning of the project? And in what ways?

b) On a scale of 1-5; how well do you think the Project Team members /Researchers are integrating (stakeholder) input?
    i) Can you discuss the reason for this answer/elaborate on this answer?
    ii) Has your level of trust changed since the beginning of the project? And in what ways?

8) People: Trust in Community Members/Stakeholders
    a) On a scale of 1-5, what is your current confidence in the stakeholders?
        i) Can you discuss the reason for this answer/elaborate on this answer?
        ii) Has your level of trust changed since the beginning of the project? And in what ways?

9) Process and Products: Trust in what is being produced and how
    a) Thinking back on [development of a project deliverables]… on a scale of 1-5, how confident are you in…
        i) The process that led to the results
            Can you discuss the reason for this answer/elaborate on this answer?
            Has your level of trust changed since the beginning of the project? And in what ways?
        ii) The results (themselves) that were presented
            Can you discuss the reason for this answer/elaborate on this answer?
            Has your level of trust changed since the beginning of the project? And in what ways?

10) Did you notice / experience any erosion in trust over time?
    a) Y/N/unsure
    b) Can you elaborate?

11) Do you think that the trust established within the project will translate beyond that small circle moving forward?
    a) Y/N/unsure
    b) Are there examples of how you are extending the trust built in this project to other aspects of your work? (Do you see evidence of “transmission” / “transferal” beyond this project?)

Influence

Create a timeline of the project showing the important steps and milestones. Explain to the participant that "the timeline represents how this project unfolded over time. During the focus groups we asked respondents to identify the moments in which they had the most influence on the collaborative process. [Insert #] broad roles/ types of influence emerged from our analysis. Participants assumed several roles during this project. We want to check back in with you on this issue of influence".

12) Please identify the ways you were able to contribute and have influence
13) Identify moments when you had the most influence
14) Identify moments when you did not have influence
15) Did some groups or individuals influence the project more than others? Was this positive influence or did their influence disrupt the process and outcomes?

Reflection and Closing

16) What do you wish would have been done differently in this project?
17) Considering the costs and the benefits, would you say co-production done in this way is/was worth it?
    a) Y/N/Unsure.
    b) Would you do it again? Y/N/Unsure.
    c) What piece of advice would you offer a team embarking on a co-production project like this?
18) Is there anything we have not asked you that we should have? Any final thoughts you'd like to share with us?

Interview questions for participants who never or rarely participated

1) We have your name on the participant list, but we recognize that you only attended one meeting or were unable to come at all. / How would you characterize your relationship with [insert project]?
2) What is your understanding of the goals of the project?
3) What were some of the reasons why you were unable to join (or continue with) the project? Did you experience barriers to participating? (institutional, personal perspective)
4) Do you participate in other research projects? What motivates you to participate?
5) How could the [Insert project] have engaged you better?

Appendix B5: Participant observation

Participant Observation occurs during all aspects of the project network activities. The research anthropologist was in charge of keeping and maintaining notes (stored in a notebook) that were used to fill in gaps of understanding, helped shape other research protocol, and were referred to when considering process adaptive management. During workshops, notes covered the following topics:

- A description of the room: For example: How the chairs and tables were arranged, where poster boards where placed, etc.

- Participant orientation: Where were participants seated, how was the PT seated in comparison to the stakeholder groups. Who chose to sit near whom, etc.

- Participation: Who was paying attention and when. During what moments were participants "seemingly" distracted with computers and phones. At what moments and with whom were participants having side conversations.

- In coordination with the workshop agenda notes were taken about: questions that arose and who asked them, comments and clarifications and who gave them, did participants appear engaged and their mood.

- During breaks the researcher noted: who chose to sit with whom, what types of conversations were sparked, etc.

Appendix B6: Focus groups

Focus groups are most useful when researchers are interested in how a group thinks about issues specific to the process (versus an interview when research focuses on individual perceptions). Focus groups provide information on shared experiences as participants explore topics though open discussion. In RM, focus groups serve as opportunities to delve deeper into specific topics to explore the perceptions and experiences of co-production from subgroups within the project. Using subgroups helps to level power, allowing for more open discussion. As such you will conduct the same focus group multiple times.

We recommend conducting focus groups during Phase 2, as enough trust will have built up between RM researchers and participants to aid an open discussion. Likewise, by Phase 2, subgroups have also coalesced and developed trusting relations. Being a part of a focus group can also bring individuals within subgroup together in an enjoyable activity wherein they share their experiences and find commonalities. The following are steps to consider when conducting focus groups.

Before the Focus Group:

- Consider the themes and types of questions you want to ask the subgroups. Most likely the research that has already been conducted in Phase 1 and the beginning of Phase 2 will make clear questions of interest for the focus group.
- Consider the location of the focus group. They can be done in person or via a virtual conference platform. Each have their benefits and drawbacks. In person allows people to connect more easily and work together on activities, however it requires more time and money to accommodate travel. Virtual platforms are harder to facilitate, however, they are often more convenient when participants live and work in different regions.
- Determine the subgroups that will take part in the focus group. Consider carefully the commonalities among individuals and how those commonalities (and differences) will impact responses during the focus group. Throughout our research, for example, we were interested in perceptions (similar or different) between community members and university scientists, and divided groups accordingly.
- Determine the roles of each RM researcher. As with other aspects of our research we had a facilitator and note taker. We recommend having at least 2 people run the focus group. It is possible to switch roles using the focus group, but be sure to have that well planned beforehand.
- Create an agenda or guideline that takes 45-60 mins to complete. We recommend a mixture of questions and activities as some will feel more comfortable voicing their ideas while others feel more comfortable writing or interacting with diagrams.
- Summarize the goals and structure of the focus group and send it to participants indicating when this will occur and how long it will last.

During the Focus Group

- Remind the participants about IRB protocol and brief them on the goals and structure of the focus group.
- Co-develop guidelines or codes of conduct (concerning confidentiality and interruptions).
- Start with ice breakers or warm-up exercise to create a comfortable atmosphere.
- Work as a RM team to help ensure every participant has had the opportunity to speak. This requires the team to be attentive and help each other draw out reluctant speakers.
- If you are aiming for group consensus, be sure to ask if everyone agrees with observations or statements before moving on to a new topic. If you are using the focus group to compile a list of ideas or perceptions, then check in to make sure the topic is exhausted before moving on.
- Before ending the focus group, summarize key ideas and findings to make sure that what the RM team heard is aligned with how the group wants to be represented.
- End the focus group on time and thank everyone for their time.

After the Focus Group

- Depending on the type of information you gather you may want to conduct an Exit Survey as a way of gathering parallel quantitative data that will support your findings.
- Produce a report or summation of findings to share with the entire project.

Sample Focus Group Activities:

Influence

In either an in-person or virtual setting, provide a slide that shows a timeline of key activities, important steps, and milestones that occurred during the course of the project thus far. Participants were asked to place:

a) a blue star on moments when they had the most influence

b) a gold star on moments when they did not have influence

In open discussion participants were asked:

a) to explain why they placed the stars where they did.

b) did some groups or individuals influence the project more than others? And was this positive influence or did their influence disrupt the process and outcomes?

Notes were taken to record answers. The quantitative data (stars) and qualitative data were compiled after the focus group. Qualitative data was transcribed and used to

contextualize how participants experienced the negotiation process of co-production as this stage. The moments of influence (quantitative data) that were chosen were organized into a list and used to guide discussion during the final interview. By allowing the participants to define the moments themselves it helped us understand influence from their perspective as they themselves identified the parameters of the research.

Reflecting on Co-Production

Benefits

In either an in-person or virtual setting, provide a blank board. Give participants several sticky notes or use a virtual program that has a sticky note option. Prompt participants to write examples of times (at least 3) when being a part of the co-production process was useful or enlightening.

Prompts

- Think back and identify a moment/experience when stakeholder feedback left you saying AHA / gave you an insight / changed how you were doing modeling -- We are looking for examples of how co-production benefited your practice (modeling).
- Write down on paper how knowledge integration helped your work.

Invite participants to place their notes on the blank board and explain their submissions. Be sure to have the note taker write down what each sticky note refers to. Once all of the sticky notes are in place, ask the participants to discuss what they notice about the different examples.

- Are there similarities across these moments?
- What does this tell us about the value of stakeholder feedback / co-production in this project?

Listen for who was involved and if a personal interaction enhanced this moment? Was it their affiliation, their personal knowledge, or interest in the project. Also listen for ways the process of co-production helped facilitate a more productive environment to share ideas.

Barriers

In either an in-person or virtual setting, provide a blank board. Give participants a number of sticky notes or use a virtual program that has a sticky note option. Prompt participants to write examples of times (at least 3) when incorporating participant (stakeholder) feedback was difficult.

Prompts

- Think back and identify a moments / experience when integrating stakeholder feedback was really difficult? & Why? (Take a few experiences only)
- In general, what are the barriers for receiving and integrating feedback

Invite each participant to place those sticky notes on the board and give them the opportunity to explain their examples. Be sure to have the note taker write down what each sticky note refers to. Once all of the sticky notes are in place, ask the participants to discuss what they notice about the different examples.

- Are there commonalities? Differences?
- What does this mean for how co-production works (or doesn't work)?

After the focus group, code the responses of benefits and barriers into themes. These generalized themes can be listed in a survey for a ranking question. Ask participants to rank which are most meaningful or important to them. This approach can provide a quantitative element to your qualitative focus group discussion.