

THRIVING EARTH EXCHANGE PROGRAM ASSESSMENT



Photo: B. Ristroph. Pelicans on Fishing Boat in Terrebonne Parish, LA

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1. EXECUTIVE SUMMARY

In 2014, the American Geophysical Union (AGU) established the Thriving Earth Exchange Program (the Program) to strengthen and enhance collaboration among communities, scientists, and partner organizations. The intent was to help communities build healthy, resilient, thriving, just, and ecologically responsible futures. The Program has grown significantly over the last five years, interfacing with hundreds of scientists and community residents across the United States and even in other countries. The Program has taken on 87 projects during this time, and the number of Staff members has increased from two in its first year to four at the time of this Evaluation. Projects focus on a range of environmental science issues, from reducing pollution and greenhouse gases to preparing for flooding.¹ Most projects occur with very little funding, relying on the volunteer work of scientist and community participants. In 2019, as Program Leadership is considering expanding the number and geographic range of projects, AGU hired Sara Bolduc Planning and Evaluation, LLC to conduct an external evaluation of the Program.

In August 2019, with input from Program Staff (employees of the Program), Evaluators conducted preliminary interviews with selected project participants (volunteer scientists and community members) and members of Program Leadership (AGU and Program Board Members). These 19 interviews helped shape a survey that Evaluators distributed to all current and past project participants for whom contact information was available, along with Program Staff and Leadership (402 people surveyed, with a 29.9% response rate). Additionally, Evaluators undertook a case study, which involved a site visit and interviews with 21 participants from projects in southeast Louisiana. Evaluators prepared this Report based on survey data, along with information from interviews and interactions with Program Staff.

Overall, the Thriving Earth Exchange Program has advanced science and benefited participants by creating new information that improves decision-making and the quality of life in communities; enabling diverse and historically marginalized communities to understand scientific processes and gain respect for science; enabling scientists to ask better questions corresponding to community needs; encouraging people to get involved in science; and dispelling misinformation. The kind of scientific collaborations that have arisen from the Program may be particularly important where academic institutions are heavily influenced and funded by industrial development interests, such that the institutions may lack credibility.

The Program has generally succeeded in meeting the expectations of most participants, despite the lack of funding. There are a number of positive aspects about the Program that Staff and Leadership should strive to continue. These include the successful matching of community participants with scientists; the lasting relationships that have emerged from projects; the increased confidence most community participants feel about using science; and the increased interest of scientists in working on community science partnerships.

More “successful” projects (in terms of completion and participant satisfaction) tended to have the following traits: funding; a good match between the scientist and community partners; a scientist who was personally vested in the project and able to devote uncompensated time to the project; a community leader who had clear objectives and was

¹ See Thriving Earth Exchange, All Projects, <https://thrivingearthexchange.org/projects/> (Last visited Nov. 29, 2019).

able to get support from others in the community; a political climate that aligned with project goals; and a realistic scope that could be achieved within a limited timeframe (18 months).

As the Program seeks to increase the number of projects it helps facilitate, particularly international projects, some clear challenges have emerged. There are differences of opinion among Program Staff and Leadership about what goals are most important to accomplish. At the project level, there are challenges related to clarity on project goals; completion of goals related to political change (i.e., implementing policies to control pollution); time, financial, and other capacity constraints on achieving project goals; and potentially differing interests and motivations among community participants, scientist participants, and the “bridging” organizations that may help with multiple projects. Further, not every prospective project or participant may be a suitable candidate for the Program.

While the Program emerged as a flexible “start-up,” it now has several years of experience as well as information from this Report moving forward. With this experience and information, the Program may want to clarify roles and processes so that there is agreement among Leadership, community and science participants, and bridging organizations on how projects will be carried out and how information gained from projects can be better shared. The Report suggests several strategies to facilitate Program growth and sustainability, including clarification of goals, values, affiliations with partners, and political stances (or lack thereof); developing a funding mechanism or clarifying the limits of working without funding; developing a system for selecting community projects and potentially matching them with bridging organizations and funders; clarifying roles and expectations within projects; evaluating the success of projects with means other than peer-reviewed publications; sharing lessons learned; and raising the Program’s visibility.

The Report begins with an Introduction to the Program in Chapter 2, followed by a description of the Evaluation Process undertaken in Chapter 3. Chapter 4 outlines the results of the research, including Key Findings from interviews and surveys, followed by a short Case Study Discussion in Chapter 5. Based on the Key Findings, Recommendations are made in Chapter 6. Finally, the appendix contains a Dashboard of Metrics that may serve as a map for the Program as it continues to track its progress in the future (Appendix A: Dashboard for Future Tracking). Condensed Survey Results and the Survey instrument are also presented in Appendix B and Appendix C.

2. INTRODUCTION

The American Geophysical Union (AGU) launched the Thriving Earth Exchange Program (the Program) in 2014 to partner volunteer scientists with community leaders to work on community environmental science projects. Launched as a flexible “start-up,” the Program has grown to involve four full-time Staff and is now (as of Fall 2019) adding Project Fellows (volunteer project coordinators) to help manage community projects. The Program has launched 87 community projects within the United States and internationally. These have involved scientists at all career stages, with informal community/ neighborhood leaders and representatives of local government.

2.1. Program Goals

The Thriving Earth Exchange Program aims to strengthen collaboration among communities, scientists, and partner organizations. The intent is to help communities build healthy, resilient, thriving, just, and ecologically responsible futures.² In connection with this goal, the Program seeks to support communities’ awareness and application of science; change the ways scientists approach research; alter public perceptions of science; generate solutions that can be shared by many different communities; and promote equity by ensuring that all communities can participate in, contribute to, and guide the use of scientific knowledge in scientific decision-making.

The Program describes its theory of change as follows:

[I]f we scope, staff, and manage local projects that make a tangible and concrete community impact using Earth and space science, the communities and scientists who participate in those projects will be more likely to do similar projects in the future, they will be more skilled when they do that work next time, they will facilitate similar work by others, and they will build or modify institutions they are part of to support this kind of work. All of this will lead to more and stronger scientist-community partnerships, which will lead to more resilient, equitable, sustainable communities who are adapting to and preventing climate change. It will also encourage public support for and use of Earth and space science.³

2.2. Structure of Program

The Program supports a broad range of community science projects involving earth and space science. A community may submit an application on the Program’s website for Program support.⁴ At the time of the Evaluation, there was not a clear system for determining which potential projects to take on, since Program Staff had agreed to take on nearly all potential projects. Program Staff referred to potential criteria for selecting proposed projects, such as community need and likelihood of project success.

² About Thriving Earth Exchange, <https://thrivingearthexchange.org/about-tex/> (Last visited Oct. 13, 2019).

³ Thriving Earth Exchange Program Assessment: Request for Proposals, <https://thrivingearthexchange.org/program-assessment/> (Last visited Oct. 13, 2019).

⁴ Thriving Earth Exchange, Start A Thriving Earth Exchange Project, <https://thrivingearthexchange.org/start-a-thrivingearth-project/> (Last visited Oct. 8, 2019)

Once a project is selected, it generally goes through four stages: “scope,” “match,” “solve,” and “share.”⁵ There is not a formal route to initiate the scoping phase. During this phase, which may occur at an AGU conference or by phone, the community proponent works with the Program and possibly with volunteer scientists to identify and commit to working on a specific project. In some cases, the Program may post a “call” for scientists on its website.⁶ The Program matches the community proponent with a scientist who has submitted an application (through the Program’s website) to work with the particular project or with the Program more generally. Staff interview several potential scientists to determine if they would likely be a good match for a project. The match is complete once the scientist(s) and community-based project leader(s) agree to work together on a project. While community leaders are clearly identified, other participants from the community who may be involved are not clearly identified and may have no direct engagement with the Program. The Program has not thus far kept track of these other participants.

The project’s next phase is “solve,” during which the project (or at least the scientist’s work on the project) is supposed to be carried out. Based on interviews with Staff, the Program expects the final project outputs to be completed and delivered to end users for a defined outcome within six to 18 months. During this phase, Program Staff hold regular phone calls with project participants to keep the project on track. Based on interviews with Staff, total Staff time per project is estimated to be 150 hours.

The final phase is “share,” which is an effort to have the project outputs translate beyond the community, recognize the efforts of volunteers, and provide feedback on the Thriving Earth Exchange process.

In 2019, to supplement staffing needs, the Program began accepting applications for volunteer Community Science Project Fellows to be matched with community science projects. According to the Program’s website,⁷ each Fellow is responsible for getting to know the community; identifying ways science can advance community goals; finding and recruiting partner scientists to assemble a project team, managing and supporting the project; and helping share the team’s story and impact. Fellows are trained and receive ongoing technical support from Thriving Earth Exchange Staff, a peer group of Fellows, and a dedicated community science mentor.

Individual projects typically do not receive funding from the Program. According to an interviewee in Program Leadership, AGU spends around \$700,000 per year on Staff and overhead. The Program is AGU’s largest investment (other than its building) and its longest running “strategic initiative” (usually such initiatives run for a set period and then are included in regular operations if successful).

⁵ Thriving Earth Exchange, Our Approach: From Idea to Impact, <https://thrivingearthexchange.org/how-it-works/> (last visited Oct. 8, 2019).

⁶ See Thriving Earth Exchange, Volunteer Scientists Wanted, <https://thrivingearthexchange.org/scientists-wanted/> (last visited Nov. 30, 2019).

⁷ Thriving Earth Exchange, Community Science Fellowship, <https://thrivingearthexchange.org/community-science-fellows/> (last visited Oct. 8, 2019).

3. EVALUATION PROCESS

3.1. Background on Evaluation

In July 2019, the Program issued a request for proposals for an independent (external) evaluator to conduct a comprehensive program assessment of activities to date. As discussed in the Key Findings section (Chapter 4), Thriving Earth Exchange would like to scale up the Program in terms of the number of projects (especially international projects). Prior to doing so, it seeks a better understanding of project outcomes as well as metrics of success for the Program.

AGU entered into a contract with Sara Bolduc Planning and Evaluation, LLC on August 1, 2019 to undertake a five-month evaluation based on a proposal submitted in response to the Program's request. Sara Bolduc, Ph.D., and Barrett Ristroph, Ph.D., J.D. (sometimes referred to as "we" or "the Evaluators") conducted the Evaluation and produced this Report.

The Evaluation addresses the questions raised in the request for proposals as well as management issues identified by Program Staff and Leadership during interviews. The Evaluation could lead to a strategic plan for the Program that prioritizes goals, clarifies metrics and working roles/partnerships, and guides day-to-day Program decisions while maintaining flexibility in project execution.

3.1.1. Evaluation Questions

The evaluation of the Thriving Earth Exchange Program includes an assessment of 1) Program processes; 2) participant outcomes; 3) broader community impact; and 4) Program sustainability and impacts. The assessment involves a mix of qualitative and quantitative methods. It revolves around four main evaluation questions, each with their own sub-question(s):

- To what extent has the Thriving Earth Exchange program successfully supported community science projects?
 - What has been working well? What could be improved?
 - How well is the Program serving its goals (and what more could it do more)?
- To what extent are participants in this Program benefiting from their participation?
 - Are participants gaining new skills, improving agency, or building capital?
- To what extent have Thriving Earth Exchange projects had an impact on the communities they serve?
 - To what extent are communities becoming more resilient, equitable, sustainable, and better adapted to climate change?
- To what extent does engaging in community science efforts increase local capacity to understand and use environmental science in a sustainable, long-lasting manner?
 - Is there evidence that project participants are likely to participate in similar future projects?
 - Is there evidence that they enable others to do it, and if so, how do they do that?

3.1.2. Evaluation Plan

The anticipated long-term impacts of this Program aim to create or strengthen 1) collaboration among communities, scientists, and partner organizations; 2) diverse participants who are skilled and prepared to do community science research; 3) communities that are more resilient and better adapted to environmental threats; and 4) lasting

partnerships in the interest of communities and science. To assess the degree to which the Program is meeting its goals, the Evaluation examines measurable project outputs and outcomes that may lead to the accomplishment of longer-term goals.

Table 3-1: Thriving Earth Exchange Evaluation Plan

PROGRAM GOALS	OUTPUTS/OUTCOMES (short-medium term)	INDICATORS	IMPACTS (long-term)
Program Process Program has successfully supported community science projects	More projects are initiated, and additional communities participate Projects are carried out successfully and in a timely manner There is good communication between project partners Program leadership agree on priorities and goals are aligned	Increasing number of new and completed projects/year Participants' time is respected Participants are available to work with one another (incl. Staff) Number of projects funded There is an increasing "fit" "in matched teams Increasing positive interaction in matched teams There is sufficient time to complete projects Participants and leadership are clear on goals and priorities	Strengthened collaboration among communities, scientists, and partner organizations
Participant Outcomes Participants in the Program benefit from their participation	Different community stakeholders have the opportunity to work together and with scientists Community capacity is increased There is diversity among participants	Increasing diversity of participants Increasing capacity of community participants Increasing community confidence in doing science to understand challenges in their local community/environment	Diverse participants that are skilled and prepared to do community science research
Broader Community Impact Projects have an impact on their communities and science	Community has data needed and able to make environmental decisions Project data is shared widely Publications and other project outputs emerge	Project outputs are increasingly shared Projects and outputs reach an increasingly broad audience Increasing number of "other" project outputs Increasingly clear partnership benefits	Communities that are more resilient and better adapted to environmental threats
Program Sustainability Lasting sustainable community science capacity	Relationships are built between different community stakeholders Participants serve as models in their communities There is a growing interest in the value of community science	Increasing number of collaborators Increasing number of long-term collaborative science networks are established Increasing desire to engage in future community science projects	Participants maintain and build upon Thriving Earth Exchange partnerships in the interest of the community and science

This theory-based assessment “calls for the collection and reporting of data on early phases that are conceptually linked to the program’s ability to produce long-term success. That is, the data are not just interim outcomes; they are part of the assumed causal chain.”⁸ The Evaluation Plan on the preceding page (Table 3-1) follows this theory and serves as the logic model for this evaluation.

3.2. Methods

The Evaluation utilizes a mix of qualitative and quantitative methods. This mixed-method approach has added richer detail to the findings, with open-ended qualitative data supplementing the more circumscribed quantitative findings.

3.2.1. Interviews

We obtained Staff referrals of project participants and Thriving Earth Exchange/AGU Board members with whom to conduct interviews for initial in-depth information about the Program to support the development of a survey. We arranged phone or video call interviews with all who were willing to participate, as well as some additional participants that interviewees referred us to. We also interviewed all Program Staff. Interviews were semi-structured and generally covered the questions anticipated for the survey, with additional questions to Program Staff regarding the process for implementing projects. Interviewees were advised that interviews were voluntary, and that their names and identifying details about their projects would be kept confidential. In total, initial interviews took place with six Staff members, four Board members (AGU and Thriving Earth Exchange), four participant-scientists, and five participating community members.

3.2.2. Survey

Based on information gathered and feedback received during the preliminary interviews, we developed a Program-wide survey in early September 2019. Prior to distributing the survey, we shared a draft version for comments with Program Staff, as well as three AGU Board members, two community participants, and two scientists. We integrated all substantive comments received.

To determine the list of survey participants, we obtained the Program’s most recent files with emails from all Thriving Earth Exchange project participants. We also obtained a list of emails for participants in the Resilience Dialogues, a program jointly launched by Thriving Earth Exchange and the U.S. Global Change Research Program (USGCRP) in 2017. The Resilience Dialogues has similar goals as the Thriving Earth Exchange Program (partnering scientists with communities to build locally relevant climate science and information), and some of the same people have been involved. Resilience Dialogues translated Thriving Earth Exchange’s approach to community-engaged science into short, online dialogues. Resilience Dialogues continues to be supported by Thriving Earth Exchange and operates under the leadership of the American Society of Adaptation Professionals (ASAP) and USGCRP. We included Resilience Dialogues participants in our survey to compare participants’ views on project outcomes. Since Resilience Dialogues projects require a smaller investment (in terms of participant time and financial resources) than Thriving Earth Exchange projects, we

⁸ Weiss, C. H. (1998). *Evaluation* (2nd ed). Upper Saddle River, NJ: Prentice Hall. (p. 60).

wanted to see whether Resilience Dialogues participants would be more or less satisfied with project outcomes.⁹

On September 10, 2019, we sent a link to an online survey to 453 people, including current and past project participants, Program Staff and Board members, and AGU Board members. We sent two follow-up reminders on September 15 and September 23, 2019. Participants were advised that their names and identifying details about their projects would be kept confidential. The survey closed on October 7, 2019. Table 3-2 shows categories of survey participant and response rates for each category of participants. There were eight survey participants who had more than one role (e.g., both a Resilience Dialogue scientist and a Thriving Earth Exchange Program scientist). Overall, we achieved a response rate of 29.9% (40.2% excluding Resilience Dialogues participants), significantly higher than the responses the Program previously received from requests to submit feedback on completed programs (15 responses between August 2017 and July 2019).

The numbers in Table 3-2 were adjusted to exclude inaccurate emails that bounced back. Incorrect emails affiliated with the Resilience Dialogues were deleted from the survey participant roster, as the Resilience Dialogues program was not the main focus of the evaluation. We tried to find correct email information for all past and present Thriving Earth Exchange participants (even if they were no longer affiliated with their organization). In the end, 51 email addresses for Thriving Earth Exchange participants were eliminated, with eight of these addresses replaced with accurate addresses.

Table 3-2: Categories of Survey Participants and Response Rates

Group	Total Contacted	Total Respondents	Response Rate (%)
Leadership and Staff	34	17	50.0%
Community Participants	172	48	27.9%
<i>Project Community Liaisons</i>	118	41	23.8%
<i>Resilience Dialogues Community</i>	54	7	4.1%
Scientists	196	55	28.1%
<i>Project Scientists</i>	112	48	24.5%
<i>Resilience Dialogues Scientists</i>	84	7	3.6%
TOTAL	402	120	29.9%

Slightly different questions were asked to different survey respondents to better assess their experience with and opinions about projects. For example, questions regarding overall Program goals likely to be relevant only to those employed by or leading the Program were only asked of respondents who identified themselves as Program Staff or Leadership. Not all who responded to the survey completed every question posed to them. For these reasons, the figures in the Key Findings show different numbers of respondents for different questions.

To capture demographics pertaining to gender and race, we asked participants to self-report. The majority of survey respondents were female (44%), and a significant number of

⁹ We decided to include a maximum of six scientists and three community participants for each Resilience Dialogue project, as this was the maximum number of participants for any Thriving Earth Exchange project. Many Thriving Earth Exchange Projects had far fewer participants, while Resilience Dialogue projects could have as many as 21 participants.

participants either selecting that they preferred not to answer or gave no answer at all. We recognized that our effort to be inclusive in data collection through open-ended questions could lead to inconclusive results, but in this case, responses were easy to categorize under three types (Female, Male, and Fluid).

Table 3-3: Survey Respondent Diversity of Gender

Respondent gender identity	Percent of Respondents
Female	44%
Male	35%
Fluid	1%
Prefer not to answer/ No answer given	19%

In addition to gender, survey respondents were asked about their preferred description of their race/ethnic background. The open-ended nature of the question led to a total of 17 individual categories, which we were able to collapse down to seven in Table 3-4. The data here demonstrate that more than half (56%) of all respondents were Caucasian, White, or of predominately European descent.

A small number of people reacted negatively to being characterized by gender and race. For example, one participant said: “I don’t think rectifying social injustice is the prime role for Thriving Earth Exchange,” and another said, “This is a very American question and it is time to grow out of it.” More than one participant opted to identify themselves as “human” rather than any particular race. We nevertheless considered the results helpful in demonstrating participation by individuals who may be outside of the traditional stereotype of earth and space scientists. This diversity is consistent with Thriving Earth Exchange’s vision to promote participation in science from historically marginalized and oppressed communities.¹⁰

Table 3-4: Survey Respondent Diversity of Race

Respondent race/ethnic background	Percent of Respondents
African, African American, or Black	8%
Asian	3%
Bi-cultural or mixed race	4%
Caucasian or White	56%
Middle Eastern	1%
Native American	2%
South Asian	2%
Prefer not to answer/No answer given	26%

3.2.3. Case Study

We undertook a case study to gain more in-depth information based on in-person and onsite contact. We selected the New Orleans, Louisiana area as a case study for two reasons: 1) six projects are clustered there, such that more projects could be assessed most efficiently, and 2) Evaluator E. Barrett Ristroph is a former New Orleanian and already has built relationships and trust with many community stakeholders there.

¹⁰ About Thriving Earth Exchange, <https://thrivingearthexchange.org/about-tex/> (Last visited Oct. 13, 2019).

Ristroph spent eight days in the New Orleans area (September 21-28, 2019) to meet with project participants and talked by phone with those who were not available in person. She also spoke with two “bridging organizations”—nonprofits working with multiple communities involved in Thriving Earth Exchange projects. Ristroph visited project sites and attended two community meetings, during which time she was able to talk with people involved in or affected by projects. Information about project names and number of participants interviewed for the case study interviews are shown in Table 3-5. A total of 21 interviews occurred across the Louisiana Thriving Earth Exchange projects.

Table 3-5: Case Study Interview Participants

Project Name	Researchers/ Scientists	Community Leads	Bridging Orgs.
Documenting the Loss of Sacred Tribal Lands to Preserve Cultural Identity and Heritage in Louisiana and Terrebonne and Lafourche Parishes	2	1	-
Understanding Impact of Municipal Water Sources on Urban Farming (New Orleans Area)	1	1	-
Creating Community Through Neighborhood Environment Monitoring (Gentilly Neighborhood, New Orleans)	2	-	1
Assessing Flooding and Hydrodynamics for Community Revitalization (9th Ward, New Orleans)	1	1	1
Modeling Environmental Health Impacts of I-10 to Engage Residents and Decision Makers (Claiborne Corridor, New Orleans)	2	2	-
Measuring and Monitoring the Effects of Greening on the Urban Heat Island Effect, Water Uptake, and Social Challenges (7th Ward, New Orleans)	3	3	-

In this Report, comments made by case study participants during interviews are intermingled with those of other interviewees to preserve confidentiality and avoid negative political consequences.

4. KEY FINDINGS

This Chapter operationalizes the Evaluation Plan (Table 3-1) through qualitative and quantitative measures to assess four main programmatic components: 1) Program Process (Section 4.1), the extent to which the Program has successfully supported community science projects; Participant Outcomes (Section 4.2), the extent to which Participants in the Program have benefited from their participation; Broader Community Impact (Section 4.3), the extent to which Thriving Earth Exchange projects have had an impact on their communities and science; and Program Sustainability (Section 4.4), the extent to which lasting sustainable community science capacity have ensued from the Program and its many projects.

4.1. Program Process

To assess the extent to which the Program has effectively and successfully supported collaboration among communities, scientists, and partner organizations, we have evaluated shorter- and longer-term outputs and outcomes of Program process believed to lead to these longer-term impacts. This Section presents results related to Program Growth (Section 4.1.1); Project and Participant Capacity (Section 4.1.2); Project Organization and Participant Match (Section 4.1.3); Project Length (Section 4.1.4); Staff Time and Availability (Section 4.1.5); and Goals Alignment and Establishing Priorities (Section 4.1.6).

PROGRAM PROCESS OVERALL

There has been a high rate of project “completion” (nearly 80% of all projects have been marked as completed each year), although projects may be considered “completed” after initial data is gathered but project goals are incomplete.

There have been significant challenges associated with fully completing projects, namely those related to participants’ time and financial constraints.

Traits associated with projects whose participants considered them successful include the quality of the match between the scientist and community; a scientist partner whose career or life stage allowed for more volunteerism; clear and achievable project goals; and support from community members and others in a position to help.

4.1.1. Program Growth

One way to assess the success of a program is to consider the degree to which it has grown over time. There are, however, many factors involved in the development and initiation of projects. Focusing solely on increasing numbers of projects carried out over time is not sufficient to get an accurate picture of the growth of a Program. Therefore, various concepts of Program Growth are discussed here.

In terms of the Program reach, Table 4-1 shows the geographic range of all 87 Thriving Earth Exchange projects (not including Resilience Dialogues projects). These include projects in 32 U.S. states, one spanning several states, and ten in international locations.

Table 4-1: Thriving Earth Exchange Projects by Location (2014-2019)

U.S. State	Number of Projects	U.S. State	Number of Projects
<i>Alabama</i>	<i>1</i>	<i>Missouri</i>	<i>1</i>
<i>Alaska</i>	<i>1</i>	<i>Montana</i>	<i>1</i>
<i>California</i>	<i>9</i>	<i>Nevada</i>	<i>3</i>
<i>Colorado</i>	<i>5</i>	<i>New Hampshire</i>	<i>1</i>
<i>Connecticut</i>	<i>1</i>	<i>New Jersey</i>	<i>1</i>
<i>District of Columbia</i>	<i>1</i>	<i>New Mexico</i>	<i>1</i>
<i>Florida</i>	<i>3</i>	<i>New York</i>	<i>2</i>
<i>Georgia</i>	<i>2</i>	<i>North Carolina</i>	<i>1</i>
<i>Idaho</i>	<i>1</i>	<i>Ohio</i>	<i>2</i>
<i>Illinois</i>	<i>3</i>	<i>Oregon</i>	<i>1</i>
<i>Kentucky</i>	<i>2</i>	<i>Pennsylvania</i>	<i>3</i>
<i>Louisiana</i>	<i>9</i>	<i>Texas</i>	<i>6</i>
<i>Maryland</i>	<i>3</i>	<i>Utah</i>	<i>1</i>
<i>Massachusetts</i>	<i>3</i>	<i>Virginia</i>	<i>4</i>
<i>Michigan</i>	<i>1</i>	<i>Washington</i>	<i>1</i>
<i>Mississippi</i>	<i>1</i>	<i>Wyoming</i>	<i>1</i>
	<i>Total Projects</i>		<i>Percent of Projects</i>
Projects in U.S. States	76		87.4%
National (US) Projects	1		1.1%
International Projects¹¹	10		11.5%
TOTAL PROJECTS	87		

Note: This table includes five “pending” projects that have not been implemented. The “pending” international projects include one project that is planned but has not yet started and another one that was never initiated beyond the scoping phase. Three U.S. projects also fall in the pending category (one in each California, Louisiana, and Maryland).¹²

Table 4-2 (on the following page) shows the number of projects “initiated,” “completed,” “ongoing,” and “not completed” from 2014 to 2019. Initiated projects are ones that actually got started. Of these, projects are classified as either ongoing (still under way), completed or incomplete. Incomplete projects include projects that did not continue due to circumstances such as lack of participant involvement, difficulties associated with the “partner match” or other reasons discussed in greater detail the following sections. To date, out of a total of 82 projects initiated (overall), 49 projects are considered complete, 23 are ongoing, and 10 have not completed (incomplete), with an overall completion rate of nearly 80% each year.

A project is declared “completed” when the Program wraps up its engagement with project participants, not necessarily when the project is actually finished. Some projects continue on

¹¹ International Projects have taken place in Afghanistan, Tajikistan, Dominican Republic, Horn of Africa, and Jamaica.

¹² We included pending projects in our Evaluation to show the diversity and geographic range of Projects, although we recognize that there are not yet meaningful results to convey from these Projects.

for months or even years after the Program and projects part ways. Hence, the “completion rate” calculated below may not be a reasonable assessment of success on its own.

For all completed projects mentioned in Table 4-2, the mean time for completion was 15 months, with a median time of 17 months. The length of time taken for completion varies and does not necessarily reflect efficiency (as discussed in Section 4.1.4). “Staff hours spent per project” was entertained as a possible better measure of efficiency of the Program, but Staff have not been tracking project hours. We do however know that Staff count increased from two to three in 2016, and to a total of four in 2017.

Table 4-2: Status of Projects Initiated per Year (2014-2019)

	2014	2015	2016	2017	2018	2019	Total*
U.S. Projects							
Initiated	1	7	13	21	20	12	74
<i>Completed</i>	1	6	13	14	9	2	45
<i>Ongoing</i>	0	0	0	3	9	9	21
<i>Incomplete</i>	0	1	0	4	2	1	8
Completion Rate**	100%	86%	100%	81%	90%	92%	89%
International Projects							
Initiated	1	2	1	0	1	3	8
<i>Completed</i>	1	1	1	0	1	0	4
<i>Ongoing</i>	0	0	0	0	0	2	2
<i>Incomplete</i>	0	1	0	0	0	1	2
Completion Rate**	100%	50%	100%	N/A	100%	67%	75%
Total Projects							
Initiated	2	9	14	21	21	15	82
<i>Completed</i>	2	7	14	14	10	2	49
<i>Ongoing</i>	0	0	0	3	9	11	23
<i>Incomplete</i>	0	2	0	4	2	2	10
Completion Rate**	100%	78%	100%	81%	90%	87%	88%

*Note: This compilation excludes five “pending” projects that were attempted, but either never got under way, or are still pending. **Number of projects that have either completed or are ongoing as a percentage of all projects initiated in that year.

There remain challenges as the Program seeks to increase the number of projects it initiates, particularly for international projects. According to survey responses and interviews, there are also differences of opinion within the Program about what goals are most important to accomplish. At the project level, there are challenges related to clarity on the project goal(s); completion of goal(s) for political change; time, financial, and capacity constraints on achieving the project goal(s); and potentially differing interests and motivations among community participants, scientist participants, and the “bridging” organizations that help with multiple projects.

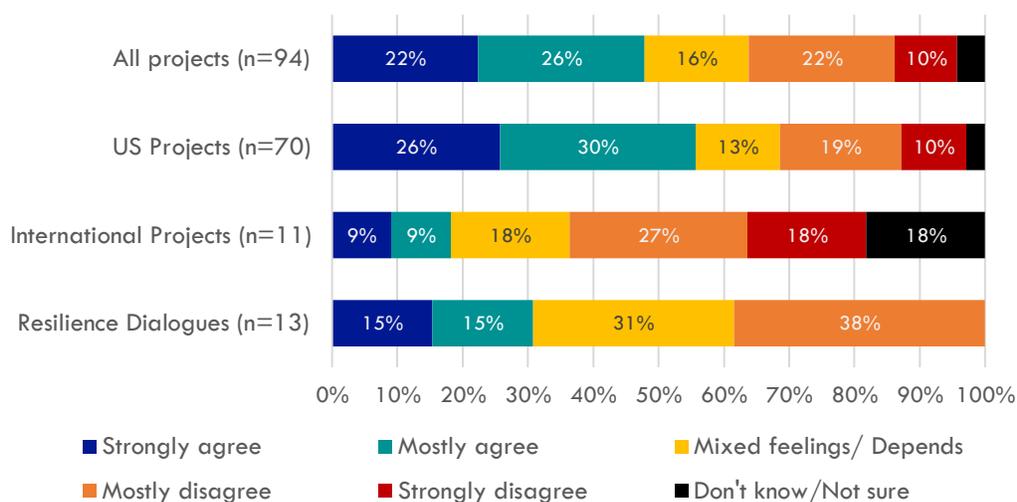
4.1.2. Project and Participant Capacity

Key challenges to fulfilling project goals relate to capacity in terms of the time and financial resources of the participants. While the previous subsection focused on the completion rate of projects, this subsection and the following subsection 4.1.3 discuss barriers to achieving the goals of project participants. Understanding and operationalizing these barriers could help future evaluators and Program Leadership/Staff gauge the likelihood of a project’s success.

Time Constraints

As shown in Figure 4-1, nearly half of all project participants who responded to the survey agreed that their project was more time-consuming than expected. This was less true for participants in the Resilience Dialogues, which had relatively clear time parameters established at the beginning of each project.

Figure 4-1: Project Was More Time Consuming than Expected



Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

Projects benefit from scientists who are at a point in their career where they can devote time to community projects, or in a field where community work is viewed as part of their job.

Interviewees offered additional insights on time constraints, including personal and professional constraints. For example, when the community participant is a member of a municipal government, there may be high turnover rates in government staff that affect the projects, and staff may have competing priorities. Similarly, when the community participant is from a non-profit or neighborhood group, there may be a lack of community volunteerism, such that one person is doing the bulk of the work.

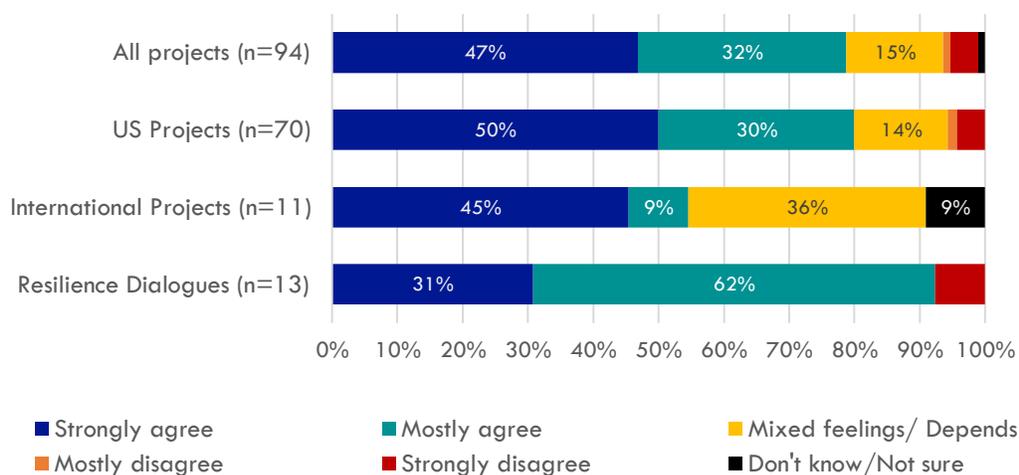
Scientist participants, who are predominantly academics, may also have limited time to contribute to Program work if it will not lead to a publication that advances their tenure or at least gives them recognition.¹³

Interviewees suggested that there may be a tradeoff in terms of time: tenured professors have less pressure to publish but are farther along in their careers and may not want to undertake some of the “less glamorous” work involved in community projects. One community participant interviewee expressed her gratitude for being able to work with a “high caliber” scientist but said that the high caliber meant that the scientist was busy doing other projects internationally and often unavailable. Projects benefited from scientists who were at a point in their career where they could devote time to community projects, or in a field such as public health where community work is viewed as part of their job.

¹³ Not all science partners are academics, although non-academics may have other limitations. For example, one survey participant described limitations as follows: “I am a federal scientist; project required taking on additional work beyond my additional job duties.”

Although many participants felt that their projects were more time-consuming than expected, Figure 4-2 shows that a substantial majority of survey participants felt that their community or scientist partners were able to devote the time needed for the project. Notably, there was less agreement among participants in international projects that partners were sufficiently available. This may reflect the additional time and capacity constraints associated with projects in developing countries. One interviewee expressed concern that the Program may not fully grasp the challenges of working in developing countries.

Figure 4-2: Partners Have Been Available to Work on Projects



Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

In contrast, the high levels of agreement regarding partner availability for the Resilience Dialogues is also notable. The Resilience Dialogues differ from other Thriving Earth Exchange Program projects in that there were many more scientist and community partners for the former.¹⁴ Many Thriving Earth Exchange Program projects only had one or two scientist partners, and some had only one or a few community participants.

Financial Constraints

Participant time constraints are intertwined with financial constraints. While the Program was initially able to offer some financial support to a few projects, it currently offers no financial support at all, nor does it necessarily provide assistance in procuring funding (although Program Staff may pass on notices of funding opportunities).

More than half of all projects have no funding whatsoever.

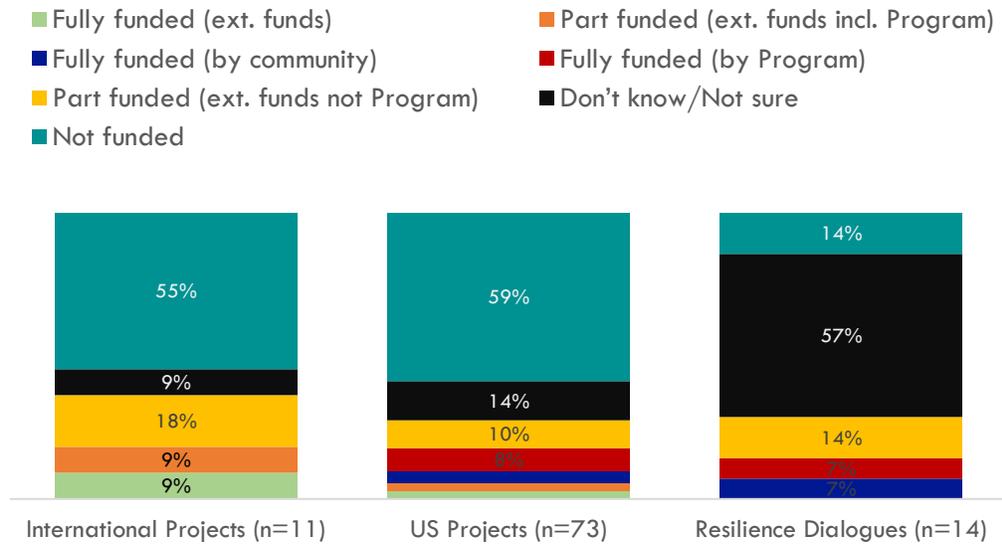
As shown in Figure 4-3 more than half of all projects have no funding whatsoever. Lack of funding is, in the words of one survey participant, “one of the main structural problems of the Program.” Others are able to get small grants, sometimes with the help of the partner scientists. Partnerships involving municipalities may also be funded through municipal revenues. Some participants use their own money. For example, one survey respondent stated, “I paid for all of the expenses for this project with my personal money, and at one point the Thriving Earth Exchange Staff encouraged me to contribute significantly more

¹⁴ Resilience Dialogues projects undertaken in the most recent year, 2018, had around 20 participants (both scientists and community members) per project.

Overall, only about 3% of all projects have been fully funded by the Program.

money from my personal funds to the project, which I declined (I could not afford it).” Overall, about 3% of all projects have been fully funded through the Program.

Figure 4-3: Status of Funding by Project Groups



Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

Almost every participant interviewed referred to funding constraints as a barrier to carrying out projects. As one scientist interviewee said, “There are some inherent limitations of having it be a full-on volunteer effort. Usually scientific inquiries are not volunteer efforts because they require equipment and implementation ... that is a limitation of the model.” As shown in Figure 4-4 (on the following page), nearly every participant who responded to the survey suggested that future projects would benefit from a dedicated source of funding.

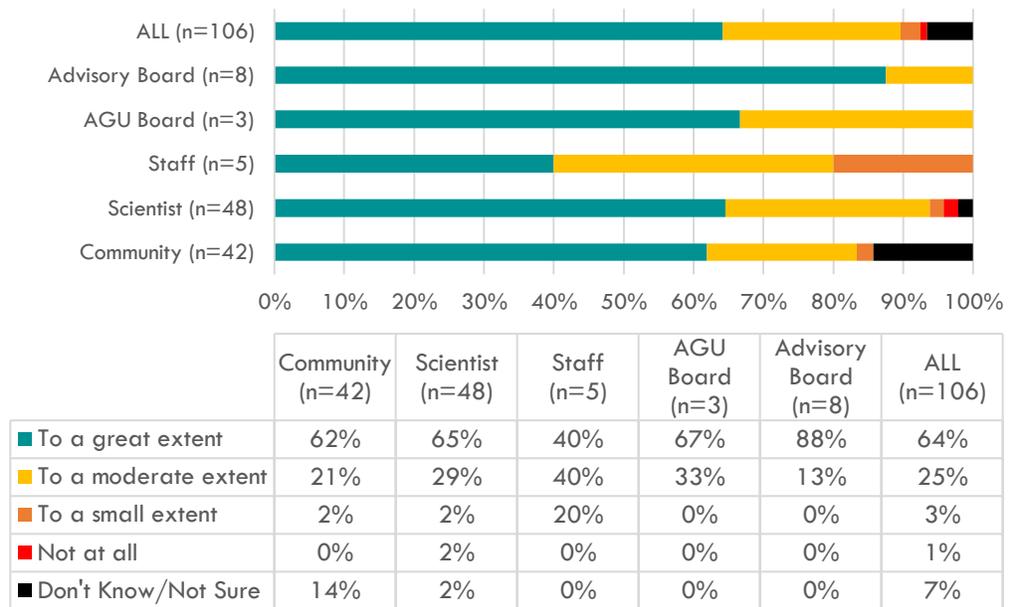
Obtaining funding is extremely time-consuming, particularly as there are often separate funders for conducting community science research (i.e., exploring the benefits of an intervention) and for carrying out a community project based on that research (i.e., implementing the intervention). Funds for carrying out a project may be even more difficult to obtain than funds for research. Additionally, those that may most need funds might not have the capacity to obtain grants. As one community interviewee said, “People who are most vulnerable are left out.”

Participation in the Program may elevate the status of a project such that it is more likely to get funding from other sources.

Because the Program does not currently offer funding or actively assist with the process of applying for funding, scientists capable of connecting with communities on their own may not see “value added” through the Program. For example, one scientist interviewee already partnering with communities outside of the Program suggested that the Program added a layer of reporting without adding human resources or funding.

That said, participation in the Program may elevate the status of a project such that it is more likely to get funding from other sources. For example, one survey participant said, “The TEX project gave us a strong enough foundation to seek local funds to support the project.” Another indicated that the Program provided letters of support and showcased the project, which led to a large grant.

Figure 4-4: Program Would Benefit From a Dedicated Source of Funding



Note: This survey question was asked of all Program participants: Program Leadership/Staff, Scientists and Community Partners, including The Resilience Dialogues (Total 120).

4.1.3. Project Organization and Participant Match

In addition to participant capacity and related funding issues, project dynamics play an important role in whether a project can be successfully carried out. Project dynamics relate to how a project is structured (i.e., how the project goal is articulated and the roles of each participant), as well as how the relationships between participants impacts project completion. While Program Staff interviewees and some project participants noted the importance of flexibility in project goals and scope to allow projects to adapt, there may be tradeoffs between flexibility and having clear direction. A number of interviewees and survey participants raised concerns regarding the lack of clear project goals, scope, roles, timelines, responsibilities, and the extent to which a project can address political issues (i.e., seek change in a governmental policy).

Currently the Program does not have a standardized process for determining which projects to select, or for getting a project started and clarifying goals and responsibilities. One scientist interviewee described the situation as follows: “We didn’t achieve what we had set out to do because the goals kept changing. It felt like a moving target ... We didn’t know who the ‘community’ was, I’m not sure I know to this day.” A survey participant indicated that their desire to participate in future projects actually decreased as a result of this lack of clarity:

It felt like the goal of our interactions with the community was not clear. There wasn't a goal that I felt like we were trying to accomplish. ... Initially, I thought we were supposed to scope a project that could be solicited for full funding. Instead we ended up with a community information campaign. It feels like we might be missing opportunities which could have been taken advantage of with a bit more guidance and clarity on everyone's part.

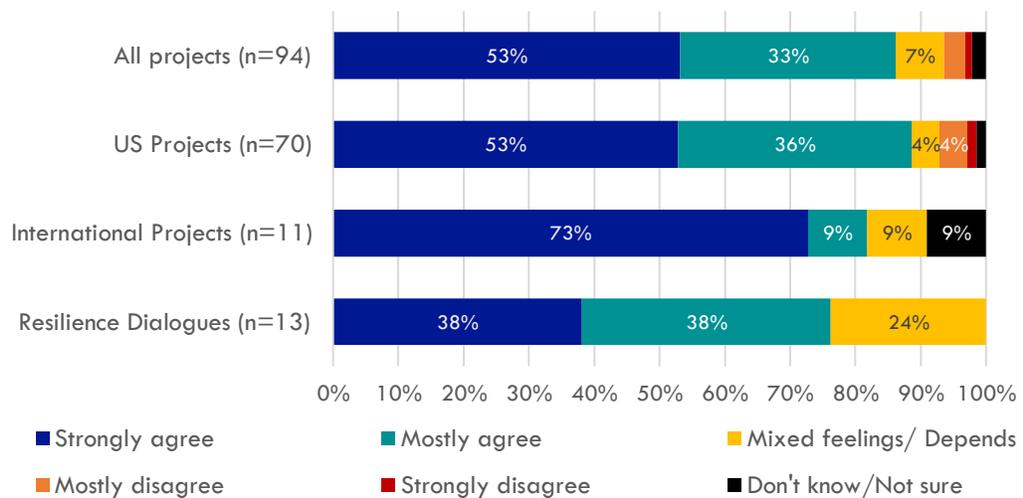
There may be tradeoffs between flexibility and having clear direction.

Project success may relate to having a realistic scope that can be achieved with current resources; a well-defined timeline; and a good partner match.

When project goals are unclear, it may be difficult to determine when a project is complete. Goals may not be clear because the community does not know exactly what it wants, has multiple goals that are too much for one project, or is not able to articulate a discrete project that a partner scientist can carry out in a short enough timeframe. Without clear goals, the scope of the project can also creep, such that projects are longer than intended. It is also possible that circumstances beyond the control of participants can change the course of the project. For example, one survey participant explained that “the time horizon for good scientific data collection and analysis doesn't match well with the rate at which the political climate changes, which has made the project less impactful than it might otherwise have been.”

Relationships between partners are another important aspect of project dynamics. A number of interviewees cited a good match between scientist and community partners as a key factor contributing to project success. Several community interviewees praised Program Staff for understanding what communities want and matching them with the right scientist. As shown in Figure 4-5, the vast majority of survey participants agreed that their partners were good matches. This may be somewhat less true for Resilience Dialogues participants, perhaps given the nature of the online connections (as opposed to connections for other projects that were in person or by phone).

Figure 4-5: The Community-Scientist Matches Were a Good Fit



Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

Good matches can lead to lasting relationships that facilitate project completion.

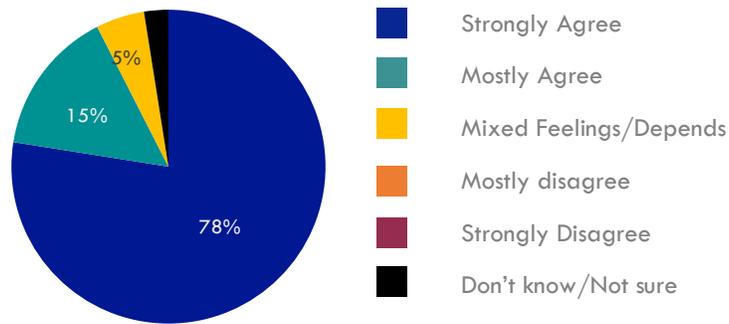
Figure 4-6 (on the following page) suggests similar findings. It shows responses to the survey question asked only of community participants, “To what extent do you feel your interactions with your matched scientist-partner(s) were positive?” No community participants indicated that their interactions were negative.

Interviewees described a good match as one involving mutual respect and similar amounts of time and capacity to devote. Scientists that interviewees described as good matches were often locally-based or somehow personally vested in the project, and were seen as open,

A good match is one that involves mutual respect and similar amounts of time and capacity.

empathetic, and collaborative. Interviewees described successful or well-matched community participants as those who were organized, knew what they wanted, had the confidence to direct and market the project, and could get strong buy-in from their peers. Good matches can lead to lasting relationships that facilitate project completion.

Figure 4-6: Community Participants Reporting Positive Partner Interactions



Note: This survey question was asked of Community Participants alone (Total 41). Not including Community Participants from The Resilience Dialogues.

However, not every participant was satisfied with the scientist-community match. For example, one survey participant said:

I think there was a lot of pressure from the AGU Board to have a certain number of project "matches" within a defined time frame, perhaps in a certain geographic distribution (like, outside of the northeast and California). Because of this, they tried to shoehorn in a lot of projects with communities that really weren't a good fit for AGU scientists, or that needed funding to work. So, some of those projects needed more help from the Thriving Earth Exchange Staff than others, and more background for the scientists than we were given. It's really unfortunate because now some of those community groups might be feeling like, oh, another scientist who just abandoned us.

Several interviewees suggested that partner dynamics interfered with the success of the project. Lack of communication from a participant can derail a project, and poor communication can lead to hurt feelings that fracture participants. It may be harder to communicate and build rapport when the scientist matched with the community is geographically distant and cannot meet in person. For example, one interviewee referred to a science partner who "has never even seen the neighborhood." Also, if a community has had no experience or a bad experience with a scientist, it can take a long time to build the trust needed for project relationships.

In some cases, differing agendas between the science partner(s) and community partners may have hindered a project. For example, one interviewee suggested that a community may have a specific agenda for political change and may reject science that does not support this agenda. A similar example was provided by a surveyed scientist participant, "The process by which a community frames its needs/questions often bakes in assumptions that the consulting scientist wouldn't approve of. My experience ... felt like a rubber-stamping exercise, in which city technocrats felt like they had all the answers they needed and simply wanted to add a credential to their plan."

Project success may relate to collective action including connectivity among project leaders and community volunteers and willingness to volunteer.

Likewise, different parts of the community may have different agendas, or the project proponent may not have the support of political leadership. For example, one survey participant described their project as “crawling along due to lack of buy in from some community partners.”

Connections to those outside the immediate community can also be important. Bridging organizations—non-profits that work in multiple communities—can facilitate projects with scientific expertise, organizational skills, and visibility. That said, divergent interests between bridging organizations and community partners may also potentially challenge project dynamics. Bridging organizations may have somewhat different goals than smaller community groups and different levels of willingness to engage in political activity. Bridging organizations may also compete with community groups for recognition and branding for a project.

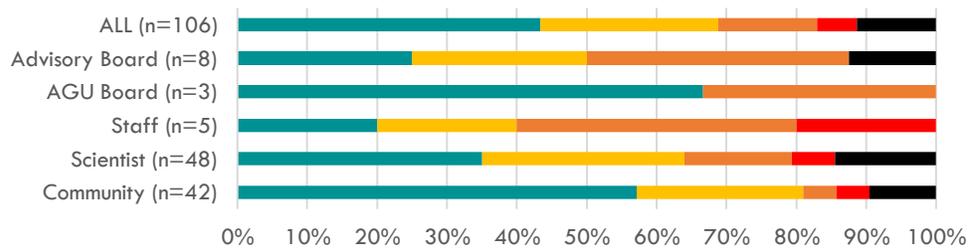
4.1.4. Project Length

How long a project should and could last relates to several factors, including the time and capacity of community and scientist participants and Program Staff, as well as the time required to garner funding and the emergence of scientific findings. Interviews with Program Staff suggested that Staff is generally not able to provide support to a project for more than 18 months. Section 4.1.1 also suggests that typical project duration averages 15 months.

There are two concerns regarding the typical project timeframe. First, there may not be sufficient time to collect the necessary data (i.e., rainfall over time), or to garner funding needed to adequately conduct research or carry out project goals. As one interviewee explained, “It takes a year and a half just to get funding, and by then Thriving Earth Exchange is already out.”

There may not be sufficient time to collect necessary data, or garner funding needed to adequately conduct research or carry out project goals.

Figure 4-7: Program Would Benefit From Continuing Over a Longer Period



	Community (n=42)	Scientist (n=48)	Staff (n=5)	AGU Board (n=3)	Advisory Board (n=8)	ALL (n=106)
To a great extent	57%	35%	20%	67%	25%	43%
To a moderate extent	24%	29%	20%	0%	25%	25%
To a small extent	5%	16%	40%	33%	38%	14%
Not at all	5%	6%	20%	0%	0%	6%
Don't Know/Not Sure	10%	15%	0%	0%	13%	11%

Projects may be marked as “completed” when some participants do not believe they are really done.

Note: This survey question was asked of all Program participants: Program Leadership/Staff, Scientists and Community Partners, including The Resilience Dialogues (Total 120).

Second, as discussed in Section 4.1.1, the labeling of a project as “completed,” may be misleading. Interviews with participants suggest that the Program ceases its involvement (marking the project as completed) when an initial deliverable (i.e., scientific information) is

complete. The goal of a project, however, is often more than merely gathering this initial information. This means that a project may be marked as completed when some participants do not believe is really done. For example, one interviewee said that he thought his “completed” project “was successful for sure ... it met my interests ... It’s just ... our vision is only halfway realized.”

Some project participants continue to work together after the Program ceases its involvement.

The Program may want to consider whether projects (at least certain types of projects) would benefit from longer Program involvement. All of the AGU Board survey respondents seemed supportive of this idea, as shown in Figure 4-7 (above). Community participants likewise expressed a strong desire for longer Program involvement. Fortunately, some project participants have voluntarily continued working together after the Program ceased involvement. Scientist participants may in those cases have acquired funding to better carry out project goals, and/or the community may have continued to build on initial results by gathering additional information or implementing decisions based on the information gathered. As one survey participant stated, “The part of the project that involved the scientist, is complete. But the rest of the project is ongoing.” This statement emphasizes the difference between research goals (for which the Program provides support) and larger, overall project goals (for which the Program does not provide support).

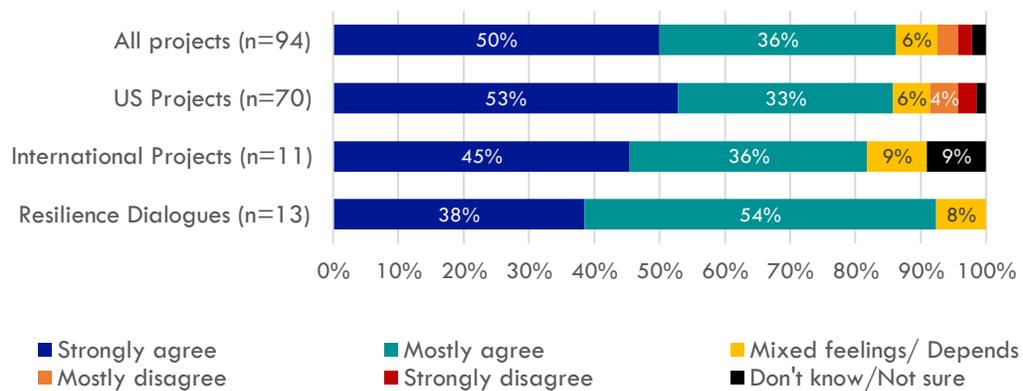
4.1.5. Staff Time and Availability

Despite the limits to Staff time and the desire for longer project timeframes described in the previous subsection, Figure 4-8 shows that the vast majority of survey participants perceived Program Staff as being readily available to work on projects.

The majority of survey participants perceived Program Staff as being readily available to work on projects.

Nearly all interview participants suggested that Program Staff did a great job of keeping projects organized and on track. One noted that Program Staff does “the work of facilitation so that partners can really listen to each other instead of having to coordinate the meetings.” Others said, “They professionalized the project”, and “When I visited the Program, I just felt these were people who cared about what they were doing and wanted to support the projects. They were very authentic.”¹⁵

Figure 4-8: The Thriving Earth Exchange Staff Were Readily Available

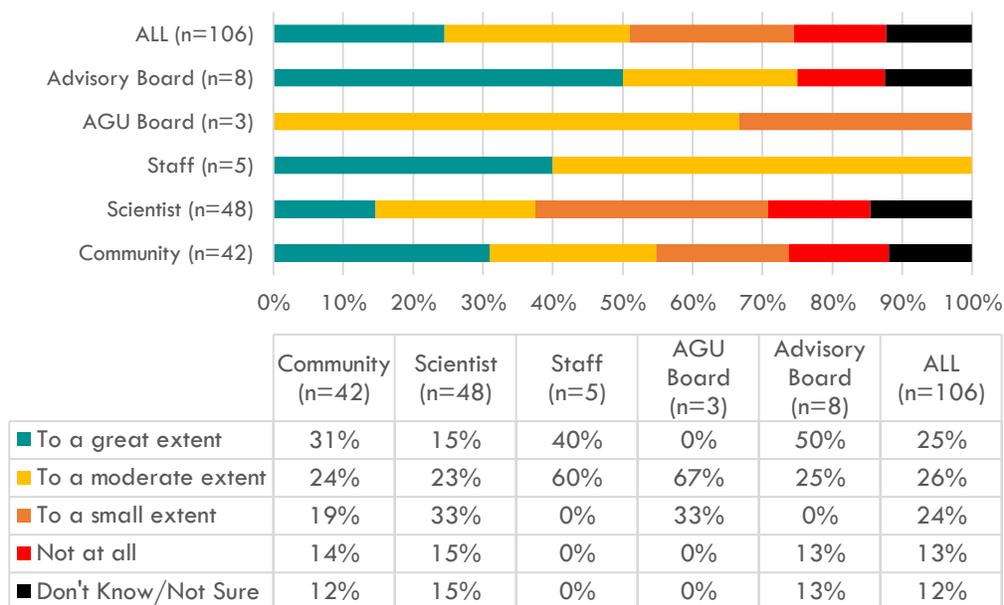


Note: This survey question was asked of all project participants (Scientists and Community Partners), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

¹⁵ That said, two interviewees indicated that there were gaps in communication when a staff member went on extended leave and was temporarily replaced by a contractor. One interviewee felt like the project “fell through the cracks.”

While the majority of participants appreciated the time and effort provided by Staff, Figure 4-9 suggests that many, particularly community participants, believed projects would benefit from additional Staff time. It is noteworthy that all Program Staff surveyed believed projects would benefit from additional Staff time as well.

Figure 4-9: The Program Would Benefit from Additional Staff or Staff Time



Note: This survey question was asked of all Program participants: Program Leadership/Staff, Scientists and Community Partners, including The Resilience Dialogues (Total 120).

Interviews with Staff suggested that the demands on their time can be overwhelming. For example, one Staff member said that due to time restraints, they tend to be utilitarian in engagement with projects rather than proactively thinking about taking them to a higher level. Some interviewees noted that Staff time limits the capacity for the Program to scale up and take on more projects.¹⁶

4.1.6. Goals Alignment and Establishing Priorities

There are two tensions in regard to goals associated with the Program. One relates to what kind of objectives projects should undertake with Program support, particularly as to whether projects should aim to accomplish political and social change. A second tension concerns the priorities of the overall Program and how to best accomplish these priorities.

Political and Social Challenges

Although science may be apolitical in the abstract, political and social issues are often interlinked with conveying and acting on scientific information. Unfavorable politics can hinder a project from being effective or even taking off the ground. For example, a project

Political implications can hinder a project from being effective or even taking off the ground.

¹⁶ The initiative of Project Fellows, where a volunteer serves a role similar to staff for a given project, may help address this concern.

that aims to reduce pollution from an industry that contributes to government revenues may be successful in gathering the information on pollution, but not in reducing it.

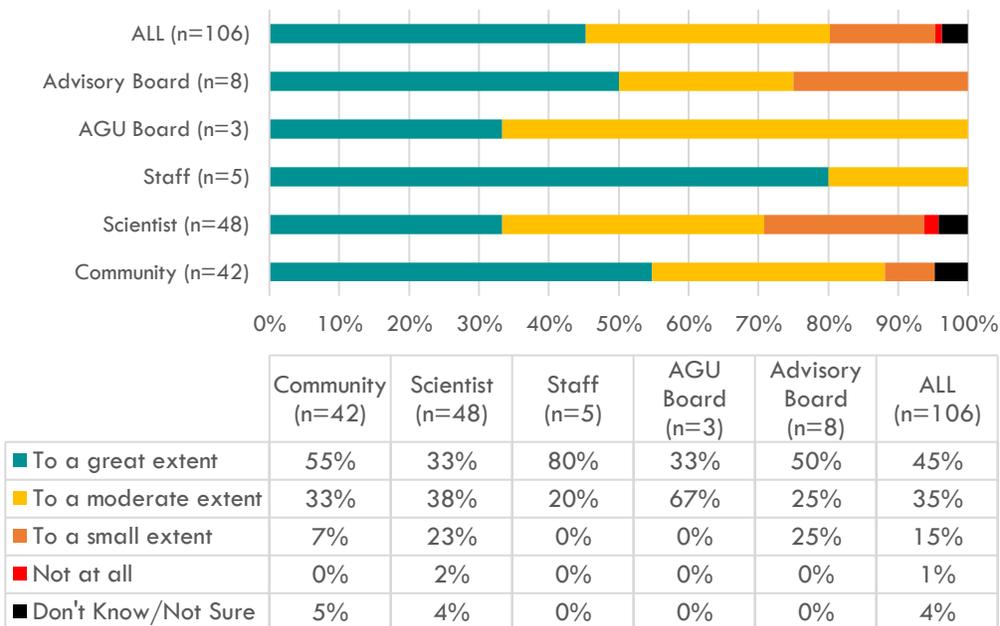
When data is effectively generated, a community may not be prepared for the political implications of that data. For example, data that highlights a pollution problem may lead to action to abate the pollution, which in turn may lead to gentrification that drives out local residents.

When communities seek support from the Program, they may be looking for more than just scientific data—they may also desire social and political change.

When communities seek support from the Program, they may be looking for more than just environmental science data—they may desire social and political change. Many interviewees suggested that projects should include experts in fields other than earth and space sciences, (i.e., communications, political change, and grant writing). As shown in Figure 4-10, nearly all survey participants (including those from the Program and AGU Boards) expressed support for incorporating non-earth science expertise into projects. Thus far, a handful of projects (e.g., Communicating and Acting on Climate Change in Hallandale Beach, Florida) have involved social scientists with expertise in communication.

The Program has generally avoided taking a political stance and taking on an advocacy role. In some cases, it has steered community participants to bridging organizations that can provide support with advocacy. But there is not a formal partnership with such organizations, and there is not a vetting system akin to the Program’s well-established process for matching earth and space scientists with communities. Further, the Program does not have a clear method for dealing with political issues that arise. It is not clear where the Program stands on political issues (other than the website suggesting a need for diversity and participation by historically marginalized communities) and how they will act to support this stance.

Figure 4-10: Program Would Benefit From Expertise from Non-Earth Science Experts

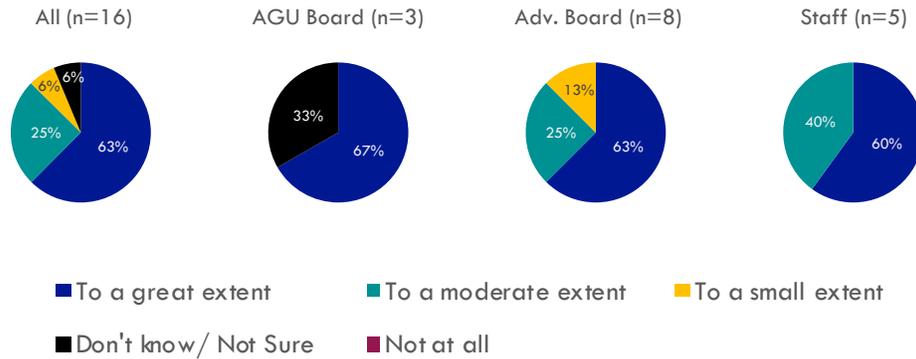


Note: This survey question was asked of all Program participants: Program Leadership/Staff, Scientists and Community Partners, including The Resilience Dialogues (Total 120).

Program Goals

As shown in Figure 4-11, in response to the survey question asked of Program Leadership about whether the Program is meeting its goals, no one suggested that the Program is *not* meeting goals. That said, particularly as the Program scales up, there may be divergent views on what the Program goals should be.

Figure 4-11: Extent to Which Leadership Thinks the Program is Currently Meeting its Goals



Note: This survey question was asked of Program Leadership/Staff alone (Total 17).

Questions raised by Program Leadership during interviews included the following:

- Is it the Program’s role to advocate for citizen science, or should the work of Thriving Earth Exchange help drive bottom-up change by engaging academics in community science partnerships?
- Should the Program move from project management to promoting the democratization of science more broadly?
- Should the Program secure funding for challenge grants that allow community groups to test a particular strategy for solving a problem, and allow the strategy or groups to shift as needed?
- Should there be minimal or volunteer staff, with money currently used for staff funding going instead to grants or contracts?
- Should the Program work on fewer, higher profile projects?
- Should the Program focus strictly on application of Western science in a community context (rather than co-production of knowledge potentially involving non-Western knowledges)?
- Should the Program do more to build community science capacity?

There is a range of views within Program Leadership regarding Program goals.

Greater flexibility may reduce clarity on what the Program most wants to achieve and how to go about achieving this.

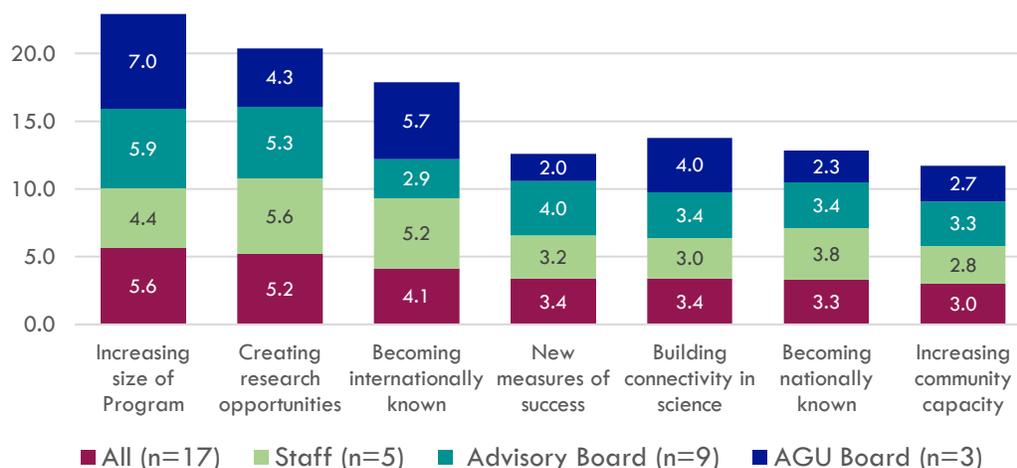
The Program was characterized by more than one interviewee as a “start-up,” with the flexibility to shift its goals and model over the last five years. Based on interviews with Program Leadership and Staff, there seems to be a desire to retain this flexibility as it contributes to learning. As with individual projects, however, the price of this flexibility may be a lack of clarity regarding what the Program most wants to achieve and how to go about achieving this. Program Board members discussed potential alternative structures for advancing community science partnerships, such as working on fewer but higher-profile projects, holding grant competitions, and advocating for the increased use of community science.

In the survey, Program Leadership (Staff and Boards) were asked to rank the following goals in the order of importance:

- Becoming nationally known for community-science partnerships
- Becoming internationally known for community-science partnerships
- Demonstrating measures of scientific success in other ways than in peer-reviewed journals and conference presentations
- Creating new opportunities for scientific research
- Building connectivity among partners in science
- Increasing community capacity to use science
- Increasing the size of for the Program

Figure 4-12 shows the responses to this question. It suggests that increasing the size of the Program, creating new opportunities for scientific research and increasing the Program’s international visibility are currently the most important priorities of Program Leadership. Overall, these were more important to Program Leadership than priorities such as increasing communities’ capacity and connections to scientists or finding metrics other than peer-reviewed journals to measure success.

Figure 4-12: Leadership Priorities for the Next Five Years



Note: Tabulated as average rank values, with 7 being the highest. This survey question was asked of Program Leadership/Staff alone (Total 17).

The concern regarding Program visibility merits interpretation. Some Program interviewees said that if the Program is not well known, it is harder to recruit scientists and garner funding. Yet a number of community participants cited AGU’s visibility as valuable; drawing attention to their needs and lending credibility to their efforts to improve science-based decision-making.

In summary, there are some tensions in project processes that the Program may want to address going forward, from the type and number of projects to carry out, whom to involve, how much time to invest in a project, and political considerations. Which overall goals/priorities the Program chooses to emphasize is an important consideration as well, as it will affect how many projects to take on as well as their type, location, and scope.

4.2. Participant Outcomes

A second component of this assessment involves gauging the extent to which participants in the Thriving Earth Exchange Program may have benefited from their involvement. This section utilizes short and longer-term outputs and outcomes as proxies to demonstrate the program’s journey towards forming a cadre of diverse participants that are skilled and prepared to do community science research. This section examines the number and diversity of people involved in the Program (Section 4.2.1) and the potential benefits of participating in the Program (Section 0).

PARTICIPANT OUTCOMES OVERALL

The Program is affecting increased numbers of participants as it continues to grow, including a significant number of people from groups that historically have had more limited involvement in science.

Project participants tend to emphasize relationships built as the most successful outcome of their project, with less emphasis on building capacity to use science.

4.2.1. Increasing Number and Diversity of Program Participants

A total of 227 individuals have participated in U.S.-based Thriving Earth Exchange projects and 27 in international Thriving Earth Exchange projects (total 254) to date (exclusive of Staff and Leadership). Additionally, about 343 community participants, scientists/experts, facilitators, and other collaborating individuals have been involved in the three rounds of the Resilience Dialogues that have taken place.

Table 4-3 shows the number of “collaborators” (here the term includes community-based project leaders, partnering scientists, and bridging organizations) that worked on projects each year. We suspect there are additional collaborators in the communities that were engaged in projects, but whose contact information the Program may not have. For instance, in the Jamaica-based project to develop fertilizer and reduce food waste, a number of local farmers helped test the product. Keeping records of such collaborators could allow the Program to better track and grow a broader network of information-sharing.

The Thriving Earth Exchange has involved 227 scientists and community participants in projects over 5 years.

Table 4-3: Thriving Earth Exchange Project Collaborators (2014-2019)

	2014	2015	2016	2017	2018	2019	Total
United States Collaborators	4	14	43	66	57	43	227
<i>Community</i>	3	6	21	32	28	23	113
<i>Scientists</i>	1	8	22	34	29	20	114
International Collaborators	1	5	3	0	2	16	27
<i>Community</i>	0	3	2	0	1	7	13
<i>Scientists</i>	1	2	1	0	1	9	14
Bridging Organizations	1	5	3	10	13	8	40
<i>For U.S. Projects</i>	0	4	3	10	13	7	0
<i>For International Projects</i>	1	1	0	0	0	1	0
TOTAL COLLABORATORS	6	24	49	76	72	67	294

Note: Number of collaborators only include those for projects that were actually initiated. Because some participants collaborated on more than one project, these numbers do not show the number of unique collaborators.

With regard to race and gender, women and people of color have historically been largely excluded from participating in science. People who may have been underrepresented in science also include persons with disabilities, and people discriminated against based on their sexual orientation or religious beliefs. Groups and people that are socio-economically disadvantaged have historically been marginalized as well. Interviews with Program Staff drew attention to the challenge of increasing diversity among the type of community or community groups that participates in projects. A community needs to be large enough to manage a project but not so large that the project gets lost among other priorities. Thus, most of the projects have involved medium-sized communities. There has not been much work with tribes and faith-based groups.

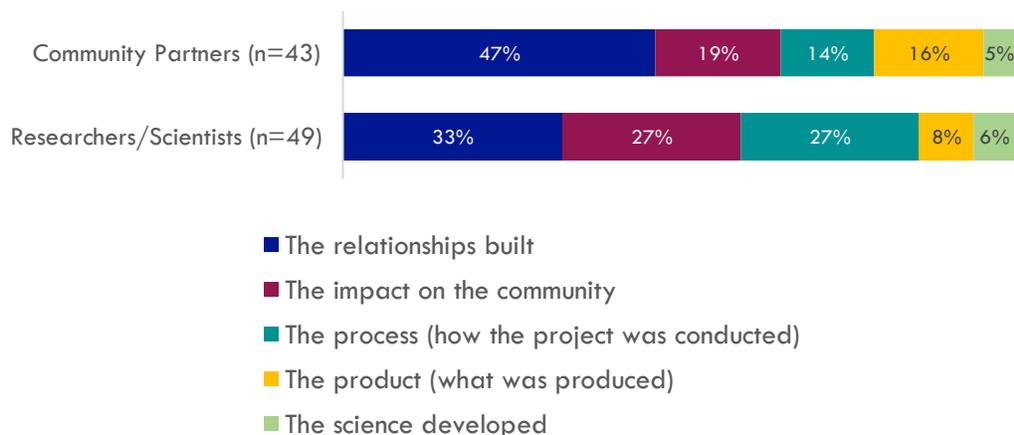
While the Program does not actively collect race or ethnicity data from Program participants, survey results showed that 56% of all respondents were Caucasian, White, or of predominately European descent. It is not clear whether the percentage of non-white participants (44%) satisfies the Program’s goal of involving historically marginalized communities, although it is certainly a larger percentage of non-white participation than that in the field of science and engineering throughout the United States.¹⁷

4.2.2. Increased Capacity, Relationships, and Other Benefits

Participants provided insight regarding the benefits of their participation. As shown in Figure 4-13, benefits of the Program go beyond project products or outputs, with nearly half (47%) of community participants surveyed describing **relationships built** as the most successful part of their project. Many survey participants suggested that the **impact on the community** was the most successful part, while others (more often scientists) referred to the process of how the project was conducted. A relatively small percentage of participants referred to the science developed from the project.

Many participants saw ‘relationships built’ as the most successful part of the project.

Figure 4-13: Sorts of Community Science Benefits (n=92)



Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

¹⁷ The 2010 U.S. census suggested that 69% of those in the field of science and engineering were white. See Guterl, Fred, “Diversity in Science: Where Are the Data?” *Scientific American* (Oct. 1, 2014), available at <https://www.scientificamerican.com/article/diversity-in-science-where-are-the-data/>.

A few survey participants provided comments suggesting that their project was not successful or did not have benefits at all. Others suggested that the project had no benefits thus far but could have benefits in the future.

Based on interviews, it appears that most scientists involved with the Program have understood that gaining a publication in a peer-reviewed journal (essential for academic tenure) would not necessarily be a benefit of the project. That said, as discussed in Section 4.3.2, some scientist partners have benefited from sharing information in publications and academic conferences.

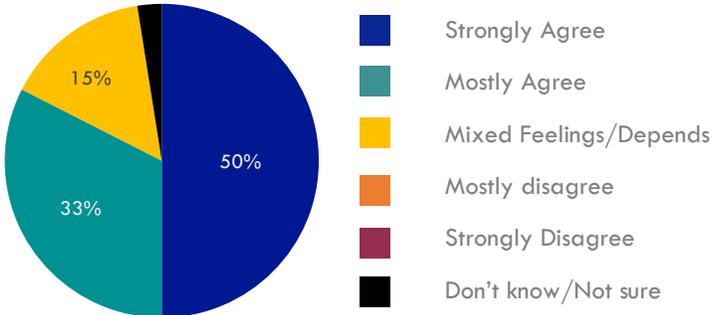
- For Scientists, project benefits discussed by interviewees included:**
- Personal fulfillment
 - Building connections
 - Demonstrating project management skills
 - Learning about how communities work and how to engage with them

An important potential benefit of community science projects (and a Program goal) relates to building the capacity of community participants to use science in order address community challenges and make better decisions. For example, one community interviewee said, “Before our group was just interested in health, but now they are starting to see how the environment impacts health.” Another expressed her concern about raising local capacity as follows: “I’m adamant about leaving my community with something...if I die tomorrow, they still know how to maintain the infrastructure...it’s not just about the team but about people taking ownership for themselves.”

The survey asked community participants the extent to which they felt more confident using science to understand and address challenges and problems in their local community/environment. As shown in Figure 4-14, no one disagreed with this statement, and half strongly agreed. A total of 83% of community participants surveyed reported feeling more confident using science after participating in the Program. Several survey participants cited increased confidence as a reason for wanting to engage in similar future projects.

83% of community participants surveyed reported feeling more confident using science after participating in the Program

Figure 4-14: Community Participants Feel More Confident Using Science



Note: This survey question was asked of Community Participants alone (Total 41, 40 responded). Not including Community Participants from The Resilience Dialogues.

Still, as suggested in the previous Figure 4-13, building science capacity may not be as important a benefit to community participants as other benefits (particularly professional relationships with those who have similar interests). Relatively few interviewees described benefits related to building community science capacity.

One concern suggested by several is that some projects may be doing more to build the capacity of the few individuals involved (in some cases only one community participant), than community groups or communities as a whole. In some of these cases, the primary individual involved had professional reasons for carrying out the project (i.e., the individual is a municipal staff member).

A few scientists suggested that community members carrying out a project may not be following scientific protocols needed for accurate, replicable measurements that would allow for publication. For example, one scientist noted that sensors put in place by community volunteers were low quality that some had been placed incorrectly and some had failed. Two interviewees furthermore expressed concern that community participants chose to ignore results that did not support community advocacy.

For community participants, project benefits discussed by interviewees included:

- Building the capacity to understand and use science
- Improving the wellbeing of the community
- Using data to get funding and engage community members
- Validating community concerns
- Bringing credibility to decision-making
- Creating a new community organization
- Serving as example to other communities
- Developing a product that could be marketed
- Gaining recognition as a community that can partner on research

One interviewee in Program Leadership emphasized the importance of benefitting communities while simultaneously advancing science: “Since the end of World War II, science has built an ivory tower, added moats, and charged fees to get into the tower—there is a real disconnect between science and society. [The Program] concretely shows how we can improve science at the same time we benefit communities.” The Program also benefits the bridging organizations that help support projects by increasing their visibility and advancing their mission.

4.3. Project Outcomes on Communities and Science

Ideally, Thriving Earth Exchange projects not only could help build capacity and provide benefits for the particular individuals involved, they also benefit others in the community and potentially communities with similar challenges. For these broader benefits to occur, there must be a way to share what has been learned in the project with those outside the project. This section focuses on how information or outputs gained from a project have been shared with others; whether sharing occurs informally (i.e., social learning) (Section 4.3.1, or in the form of a peer-reviewed journal (Section 4.3.2).

PROJECT OUTCOMES ON COMMUNITIES AND SCIENCE OVERALL

Project results are not shared widely within participating communities and between similarly situated communities, although projects have often led to poster presentations at conferences (mainly AGU).

However, projects advance science in several ways, including reducing misinformation and stereotypes about scientists; improving understanding of community research needs; and creating new information.

Ideally, Thriving Earth Exchange projects not only could help build capacity and provide benefits for the particular individuals involved, they also benefit others in the community and potentially communities with similar challenges. For these broader benefits to occur, there must be a way to share what has been learned in the project with those outside the project. This section focuses on how information or outputs gained from a project have been shared with others; whether sharing occurs informally (i.e., social learning) (Section 4.3.1, or in the form of a peer-reviewed journal (Section 4.3.2).

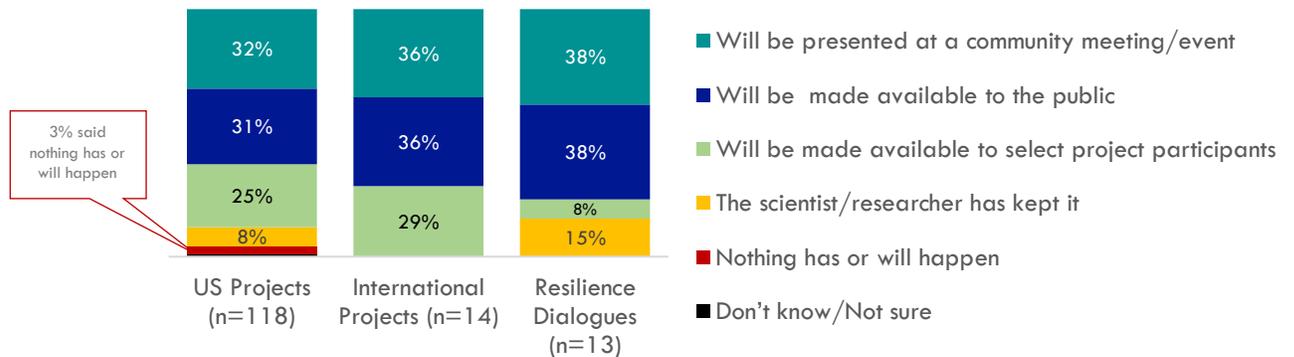
4.3.1. Disseminating Outputs and Social Learning

First, this section considers the degree to which participants perceived projects as having tangible outcomes for the community. Survey results showed that a significant majority of project participants surveyed indicated that there was a specific “output” derived from their projects (for example, a map, a plan, a policy, community/public information, a scientific dataset, etc.). The percentage identifying an output was smaller for Resilience Dialogues participants, suggesting that the additional time and effort put into other Program projects might be useful in achieving an output. That said, a number of survey respondents indicated that their project did not achieve a particular output at all.

A survey question asking what happened to the project’s “output” (if any) after the project ended provided insight on how information gained from the project was used and shared (or not). Figure 4-15 suggests that information was shared with the public and presented in community meetings or events in only about a third of all projects. For a few projects, responses indicate that the information may not be going beyond the scientists involved. This is important because the Program’s theory of change relies on the dissemination of information and science capacity beyond the project participants.

Project results may not be shared widely beyond the participants.

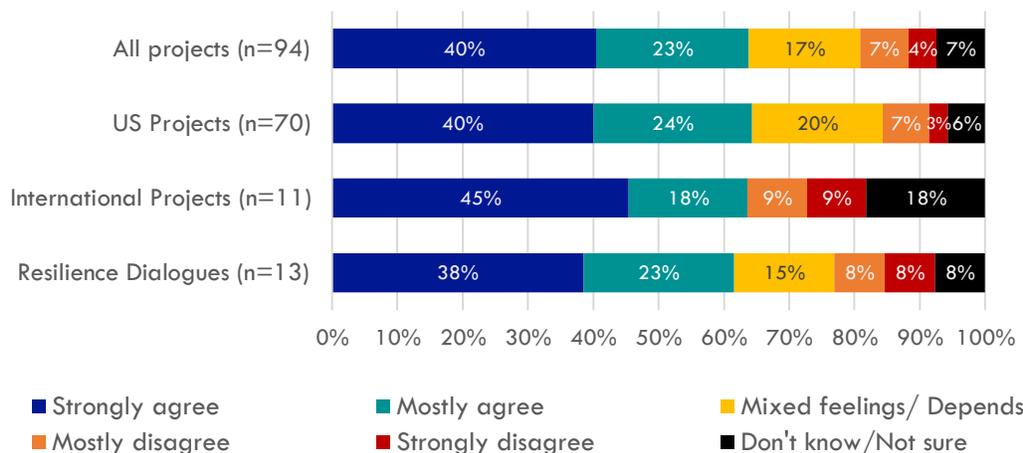
Figure 4-15: Extent of Data Sharing Beyond Project



Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

In order to try to understand whether project participants are sharing their experience with others, we asked participants about the degree to which they agree with the statement “I have been able to share my community science experience with others.” Figure 4-16 shows that more than half of all participants strongly or mostly agreed with this statement.¹⁸

Figure 4-16: Project Partners have Been Able to Share Their Experience with Others

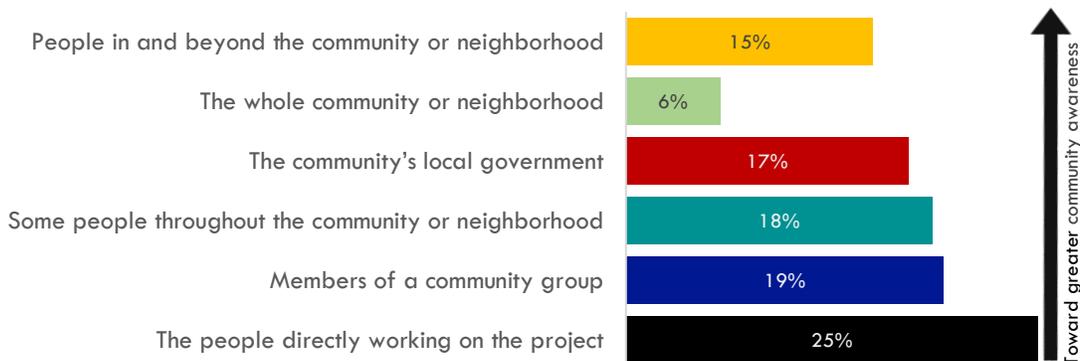


Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

A separate survey question asked community members to select which category of people were aware of the project.

Figure 4-17 shows the results, suggesting that a quarter of survey participants believed only the actual project participants were aware of their project. Only six percent (6%) believed the whole community or neighborhood for which the project was designed were aware of the project.

Figure 4-17: Breadth of Project Awareness



Note: This survey question was asked of Community Participants alone (Total 41, 40 responded). Not including Community Participants from The Resilience Dialogues.

¹⁸ Disagreement and mixed feelings were strongest for international project participants (who may face barriers not shared by U.S. projects), followed by Resilience Dialogues projects (which were more limited in time and scope) although the small sample size responding to this question may not be conclusive.

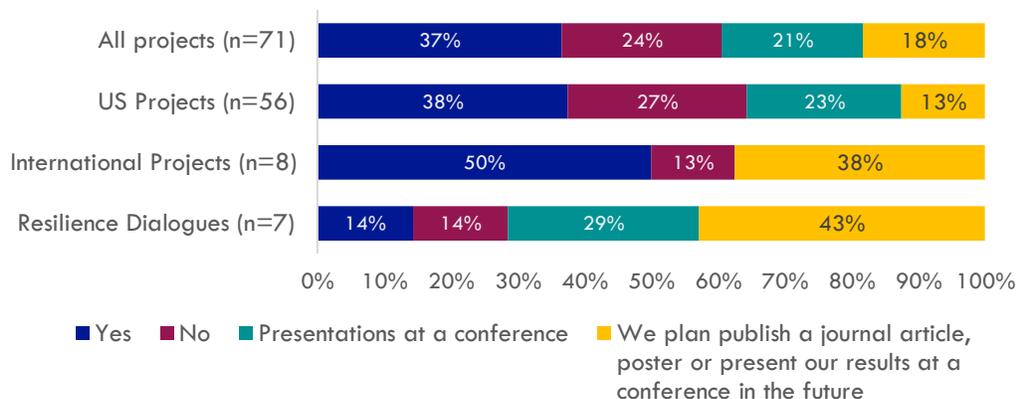
Several interviewees shared concerns that there is not a good way for participants from one project to communicate and share learning with participants from other projects. In New Orleans, even though some participants personally knew participants in other projects, they generally knew little about what was happening in the other projects.

4.3.2. Sharing Findings through Academic Publications

In some cases, information gained from projects is shared through academic publications and conferences (particularly at the AGU fall conference). Based on interviews, projects involving community perceptions and other social aspects are good candidates for academic publications. Projects involving a community in scientific data collection may, however, not be suitable for publication in an earth science journal, due to concerns such as consistency in data collection.

Figure 4-18 shows project participant responses to a survey question asking whether project-related outputs had or would result in scholarly articles, posters or presentations at a conference. While a number of project outputs are not shared in this manner, about three quarters of all survey participants indicated that the project had or would result in a scholarly publication or conference presentation.

Figure 4-18: Scholarly Outputs Resulting from Project



76% of participants surveyed reported having published (or planning to publish) a scholarly paper, or present Program outputs at a conference.

Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

The Program has made efforts to share knowledge through its website, which contains four webinars to share lessons learned and provides a link to “Community Science Connect,” an AGU platform of 171 members. Of the 41 platform posts in the last two years, almost all are by Program Staff rather than Program participants. One of the Program Staff interviewees indicated that in addition to the Program’s website, Staff also hold workshops at conferences to share lessons learned. That said, none of the participants interviewed or surveyed referred to these workshops.

Overall, it appears that information gained from a project often does not advance far into the community beyond the immediate participants, although it is likely to be involved in an academic paper or conference. As one interviewee said, “What happens after the project is really a bit of a blind spot in a lot of ways.” This raises concerns as to how much projects are improving the science capacity of communities as a whole, rather than just the direct participants.

4.3.3. Advancing Scientific Knowledge through Community Science Projects

Regardless of the extent to which a community's knowledge base is augmented, interviews (especially with Program Board members) suggested that community science projects can advance scientific knowledge in a more general sense. First, communities (or at least community participants) gain an understanding of the need to go through a scientific method to achieve a result, rather than simply being handed information. For example, a community interviewee selling a product developed as a result of the project said that the community came to understand the need to go through a scientific method to provide assurance of the product's quality.

Second, interactions between scientists and community participants can reduce misinformation and stereotypes about scientists and science. As one interviewee from Program Leadership said, "The messaging on climate change was taken over by carbon interests because of the lack of understanding of science. People don't trust scientists. Projects may allow a community member to better understand climate change rather than internalizing a message from industrial interests. This way, science can be "democratized."

Third, scientists expand their capacity to listen to community concerns and think of creative solutions. They learn to ask better questions that can lead to new research. One survey participant described the benefits to scientists as follows:

There are on-the-ground realities with local policy and planning that some scientists ignore in their hard-sciences research. The Thriving Earth Exchange Program should be looked at as a two-way learning experience, because while a community may get access to scientific expertise, the scientist is getting access to implementation expertise and is enabled to apply their work in the real world with added complexities and considerations.

Fourth, people see a project being accomplished in one place and may try a similar project elsewhere. Finally, projects create new information. For example, in the New Orleans project Creating Community Through Neighborhood Environment Monitoring the I See Change's smartphone app adds a time component to the measurement of rainfall and allows for "ground truthing" using community-sourced data. Community science projects can advance the applications of certain kinds of science, especially interdisciplinary work.

4.4. Program Sustainability

Program interviewees (mostly Program Leadership) indicated that, after five years of fostering community science projects throughout the United States (with some international projects), the Program aims to scale up in terms of the number of projects and their geographic range (particularly in developing countries). This section evaluates the sustainability of the Program with a view as to whether it can scale. In this context, "sustainability" is not about environmental sustainability. This sort of sustainability refers to the Program's sustained impact on participating communities or even more broadly. Specifically, we look at the endurance of relationships built (Section 4.4.1); enduring commitment to community science (Section 4.4.2); and the Resilience Dialogues as a model for future projects (Section 4.4.3).

PROGRAM SUSTAINABILITY OVERALL

Projects generally lead to meaningful relationships among participants within each project and, in the majority of cases, increase participants' desire to engage in future similar projects.

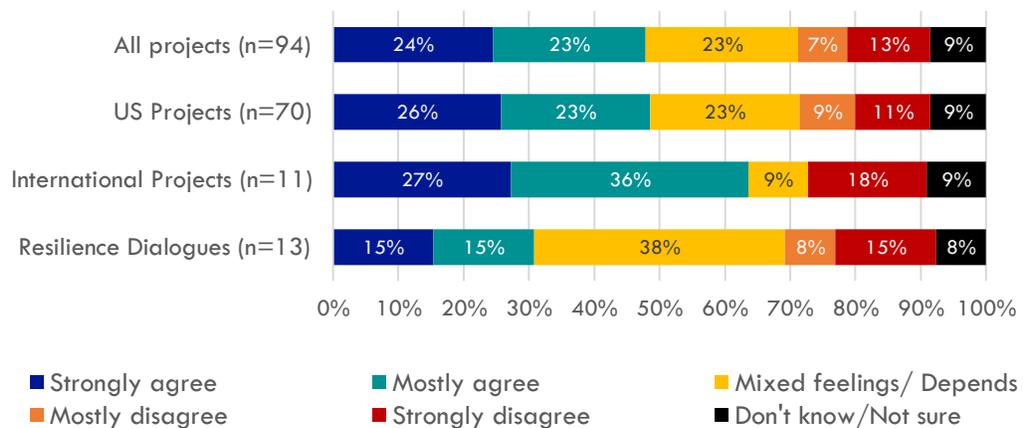
Project-related challenges discussed in earlier sections can reduce some participants' desire to engage in future similar projects.

The Resilience Dialogues model (two weeks of online interaction) is a viable way to advance community science with little to no funding, but it may not lead to the same capacity- and relationship building as Thriving Earth Exchange projects.

4.4.1. Lasting Relationships

As discussed in Section 4.2.2, Program participants recognized relationships gained through projects as a key benefit. Such relationships may pave the way to continue a project and engage in future projects. In addition to asking about project benefits and the fit of the match, one survey question specifically asked project participants about the extent to which they agreed with the following statement: "The community science project I am/was working on enables(d) me to establish long-term collaborative science networks." As shown in Figure 4-19, most participants either strongly agreed or mostly agreed with this statement, particularly those working on international projects (presumably in locations where relationships are even more critical than in the United States to accomplishing work). That said, a number of people did not agree, particularly for the Resilience Dialogues (where relationships formed only through internet exchanges may not have been as strong as for other projects).

Figure 4-19: Long-Term Collaborative Science Networks Have Been Established



Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

More than one community interviewee said they were continuing to work with science partners after the Program's involvement ended to continue or expand their projects. One survey participant described the importance of connections as follows:

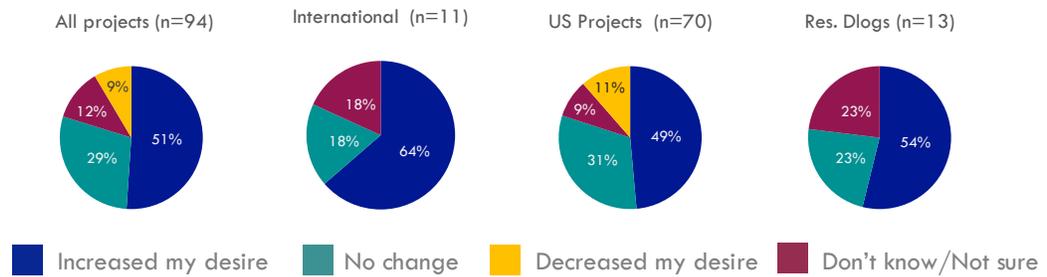
Our project has required me to reach out into our community to find related or needed resources that I did not know were even available. Now that we have made these local connections, we don't want to lose them, and so we will probably leverage this new network for follow-on projects.

4.4.2. Enduring Desire to Engage in Community Science

This subsection assesses the potential for project participants to participate in similar future projects, and whether and how participants can enable others to participate. A survey question asked participants whether their experience with the project affected their desire to engage in future community science projects, and why or why not. As shown in Figure 4-20, overall, about half of all participants expressed an *increased* desire to engage in future community science projects, while nearly a third suggested that the project had not changed their desire (this may be because participants were already feeling engaged when they began their community science project). Responses were more polarized for international project participants, with a strong majority expressing *increased* desire, but still 18% indicating *decreased* desire. Responses were somewhat more negative for Resilience Dialogues participants, with nearly a quarter indicating a *decreased* desire to engage in community science projects in the future.

90% of responding Program participants expressed increased desire to participant in community science projects

Figure 4-20: Desire to Continue to Engage in Future Community Science Projects



Note: This survey question was asked of all project participants (Scientists and Community Participants), including Resilience Dialogues participants (103 total) only. It excludes Program Leadership/Staff.

As a follow up to this question, participants were asked why their experience either increased or decreased their desire to participate in community science projects in the future.

The following are examples of some of the positive responses to a follow-up question asking them why their desire increased:

- “It has given me a concrete example of how a community science project can be used to supplement our existing plans, goals, and strategies. Prior to participating it was fairly difficult for me to envision the role that community science would play in a given project. Now I have one example from our own community and many examples to refer to from other communities.”
- “With even a small institutional support and the help of an expert network such as AGU Thriving Earth Exchange, we successfully proved that doing a semi-technical work to inform advocacy work was possible. This experience enabled natural and social scientists to collaborate and helped science secure a role in affecting discourse in social issues. Most importantly, science workers and community members learned from each other and developed a bond that empowered or improved everyone.”

Participants expressing **increased** desire to engage in community science in the future referred to:

- The important purpose of their project
- The value of science
- The quality of partners
- The support of Program Staff
- The success of this or any previous community science project

One Resilience Dialogues survey participant described their experience negatively as follows:

There was a big gap that was never bridged. The community kept saying “we have a problem!” The scientists said, “Yep we know” and kept asking what the community needed. The community didn’t know what they needed and hadn’t thought through how to answer that. The scientists threw a ton of suggestions and website and resources at the community (probably too many). The community said that that wasn’t what they needed or didn’t want to have to look through the resources or didn’t have time. The scientists said, “OK, what do you need to solve your problem?” And the community repeated the fact that they had a problem. The scientists agreed there was a problem and asked what the community needed. The community responded by repeating the problem. Ad infinitum.

A scientist interviewee asked about willingness to engage in future projects answered hesitantly, “Yeah. To the extent I only have to do a couple hours a month or so.”

Participants expressing **decreased** desire to engage in community science in the future referred to:

- The amount of time required
- A lack of motivation on the part of other participants
- A bad match or divergent agendas among participants
- Tensions with a bridging organization
- Lack of clarity regarding project goals
- Poor coordination

4.4.3. Resilience Dialogues as a Model for Future Projects

As indicated in the Methods Section (3.2), we decided to include Resilience Dialogues participants in our survey to compare participants’ perceptions of project outcomes. If similar results could be yielded with less investment (in terms of participant and Staff time), the Program might consider adjusting its model for Thriving Earth Exchange projects to one that is closer to Resilience Dialogues (i.e., mostly online over a short timeframe involving larger numbers of participants per project). It is important to acknowledge the limitations of our findings regarding Resilience Dialogues participants however, as the small number of these respondents limits our ability to draw conclusions for the group as a whole.

It is nevertheless noteworthy to highlight how survey responses from Resilience Dialogues participants have differed from those in other projects:

Thriving Earth Exchange projects may have longer term results than Resilience Dialogues projects but are more resource-intensive.

- About twice as many Resilience Dialogues participants as those for other U.S. projects indicated that the project was not more time consuming than expected.
- Compared to participants in other U.S. projects, significantly more Resilience Dialogues participants indicated that their partners were able to work on projects.
- Participants in other U.S. projects were somewhat more likely to strongly agree that their project achieved results, although fewer Resilience Dialogues participants indicated that their project achieved no results.
- Larger percentages of Resilience Dialogues participants indicated that they were not able to share project results.
- Slightly larger percentages of Resilience Dialogues participants indicated they did not build lasting relationships.
- Resilience Dialogues participants were significantly more likely to indicate a decreased desire to participate in future projects.

In short, participant reactions to the Resilience Dialogues are not extremely different from those of other U.S. projects, but the more resource-intensive Thriving Earth Exchange projects may have longer term results (particularly in terms of relationships, future participation, and capacity building).

5. CASE STUDY DISCUSSION

The Mississippi River Delta in Louisiana provided a good case study not only because of the efficiency of multiple projects located concurrently, but also because this part of the country has had a history of environmental justice challenges in which historically marginalized communities have had little access to science and limited ability to participate in science-based decision-making.¹⁹ Additionally, the combination of climate change and industrial development (i.e., oil extraction, canals cut through wetlands, and the 2010 Deepwater Horizon spill) have contributed to wetland loss that has exacerbated the effect of severe weather on erosion and flooding in New Orleans and along the coast.²⁰ Hurricane Katrina devastated low-income neighborhoods in New Orleans and along the coastline. As these communities have still not fully recovered, community advocates have emerged, eager to improve the lives of their community members. In the words of one interviewee, “New Orleans provides a rich path to things going on. There are so many small NGOs and so many things going on that it’s low-hanging fruit. Since Katrina, neighborhoods have had more of an identity.”

Many of the community-based project leaders that Evaluator Ristroph met were women of color who initiated the projects out of concern for their communities. All six of the projects studied related in some way to water, namely the flooding that has increasingly troubled New Orleans and south Louisiana over the last few decades. Half of the projects were considered completed by Program Staff, although many participants in these projects expressed interest in continuing to move forward with their goals. While almost all of these projects were initiated after conversations and presentations at the 2017 AGU conference (which took place in New Orleans), each was entirely independent of the other (i.e., there was no network for collaboration among different projects).

Several community participants that Ristroph met shared their concerns about corruption among political decision-makers and even educational institutions. Some participants emphasized the important role that Program scientists served in providing non-biased, uncorrupted information that validated community concerns. Some Louisiana residents view local academic institutions as lacking credibility, since they are heavily funded by the oil industry. As one interviewee said, “I am so sick of the experts coming in against us.” Funding for projects in the case study area is a particular concern as funders may be associated with local industry, and projects that draw attention to negative impacts of industry (i.e., pollution and land degradation) may lose this funding. For this reason, specific details and events associated with case study projects are generally not shared in this Report. Some of the challenges that these projects faced are discussed in general terms in Section 4.1.

¹⁹ Abigail D. Blodgett (2006) An Analysis of Pollution and Community Advocacy in ‘Cancer Alley’: Setting an Example for the Environmental Justice Movement in St James Parish, Louisiana, *Local Environment*, 11(6): 647-661; Barbara L. Allen, (2007). *Environmental Justice and Expert Knowledge in the Wake of a Disaster*. *Social Studies of Science*, 37(1): 103–110; Merrill Singer (2011) *Down Cancer Alley: The Lived Experience of Health and Environmental Suffering in Louisiana’s Chemical Corridor*. *Medical Anthropology Quarterly*, 25(2): 141-163.

²⁰ Barbara L. Allen (2006) *Cradle of a Revolution? The Industrial Transformation of Louisiana’s Lower Mississippi River*. *Technology and Culture*, Project MUSE 47(1):112-119; L.A. Carter, et al (2018) *Southeast*. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [D.R. Reidmiller, et al (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 743–808; E.B. Ristroph and Martin Robards, *Preparing for the Aftermath of Drilling on Arctic Lands*. *LSU Journal of Energy Law and Resources* (forthcoming).

The power of the oil and petro-chemical industry is such that one scientist interviewee said, “I keep my name out of everything I do and try to keep my name on the sly.” One person with whom Ristroph was scheduled to speak quit her affiliation with the project just before the interview; another participant speculated that this was a result of political pressure.

Another concern highlighted by interviewees is that if a project alleviates environmental problems in historically African American areas, gentrification may result. One community interview said that fear of gentrification was a barrier to community involvement, but noted, “We can’t allow other people to appeal to gentrification.”

The magnitude and complexity of environmental/climate challenges and political concerns associated with the case study area may be greater than those for other areas in the United States where Thriving Earth Exchange projects have occurred or might occur in the future. However, the insights from the case study may be helpful as the Program expands into other countries and communities with emerging democracies and significant environmental and climate justice challenges. In short, the Program may want to be prepared for the political ramifications from scientific findings that draw attention to environmental injustices.

The Program may want to be prepared for the political ramifications from scientific findings that draw attention to environmental injustices.

6. RECOMMENDATIONS

We developed the recommendations in this section based on those provided by survey respondents (who were asked to provide open-ended recommendations), interviewees (including case study interviewees), as well as our own observations and conclusions. While many of the recommendations call for modifications to the way the Program and projects are managed, it is important to note that the Program currently does a number of things well. The following box highlights factors that are currently successful and that Program Leadership and Staff should strive to build upon.

OVERARCHING ACCOMPLISHMENTS: FACTORS TO CULTIVATE

Establishing lasting relationships: The Program's well-established vetting process for matching earth and space scientists with communities has likely contributed to lasting relationships. Nearly half (47%) of community participants surveyed described "relationships built" as the most successful part of their project. Staff should continue their efficient efforts in matching community participants with scientists as these collaborations are likely to support enduring relationships beyond the project's duration.

Organizing: Nearly all interview participants suggested that Program Staff did a great job of keeping projects organized and on track. Staff should continue its efforts to motivate project participants to progress.

Increasing scientists' interest in communities: A total of 128 scientist partners have been engaged in more than 80 projects over five years. The Program should continue to reach out to new scientists to engage them in community science work.

Building confidence: An overwhelming majority (83% of community participants surveyed) reported feeling more confident using science after participating in the Program, and about half of all participants overall expressed an increased desire to engage in community science projects in the future. The Program should continue its work partnering communities with researchers, as participating in community science projects increases community confidence to use science and the likelihood of engaging in future community science experiences.

Generating scientific information: Roughly three quarters of all survey participants indicated that their project had or would result in a scholarly publication or a conference presentation. The Program should continue to promote engagement in conferences and other scholarly venues, such as the annual AGU conference.

Adaptive Capacity: Program Staff and Leadership have been open to new ideas that can improve the quality of the Program without much funding, such as the inclusion of volunteer Project Fellows. The Program should maintain its keen sense of innovation and flexibility to produce desired outcomes at a relatively low cost.

Increased legitimacy of communities and projects: AGU's visibility can draw attention to the needs of community partners, legitimize findings, and increase the likelihood of getting funding to address these needs. AGU should continue to support communities engaged in earth and space science to address local challenges.

In the following Sections, we highlight opportunities for improvement by broad categories: Program Scope (Section 6.1); Project Selection and Organization (Section 6.2); Evaluating Projects (Section 6.3); Sharing Information and Connecting Projects (Section 6.4); Visibility (Section 6.5); and Considerations for International Projects (Section 6.6).

6.1. Program Scope

OPPORTUNITIES FOR IMPROVEMENT: PROGRAM SCOPE

Program Leadership may want to prioritize goals and consider whether the current model is the best way to achieve these goals.

If Project Fellows are insufficient to increase capacity, then Program Leadership may want to consider hiring additional Staff or operating under a different model.

The Program should consider developing a code of ethics or written acknowledgement of values and clarify the extent to which the Program can or cannot assist community participants in achieving goals beyond increasing community science capacity.

The Program may consider establishing a system for matching Bridging Organizations with communities.

It may benefit the Program to charge municipalities/communities a small fee to participate or match communities with foundations or grant writers who can provide support with funding.

6.1.1. Overall Program Goals and Project Model

Survey responses from Program Boards and Staff indicated divergence regarding what are the most important Program goals. Program Leadership may want to prioritize goals (perhaps based on the survey results of the Report) and consider whether the current model of unfunded small projects, each involving about 150 hours of paid Staff time, is the best way to achieve these goals. This Report does not take the view that there is a better way to achieve Program goals; we simply advise consideration of which goals are most important, as such consideration may or may not dictate a different model.

If the highest priority goal is to increase project numbers (as survey results suggest), then the Program may consider adopting a model closer to the Resilience Dialogues, which involves less time on the part of participants and Staff. If increasing diversity among participants is a Program goal, the Program may want to clarify the kind of diversity it is seeking (e.g., diversity in race, gender, age, community size, location) and collect at this data for each project etc.

6.1.2. Staff Capacity

Program Staff size limits the extent to which the Program can expand in terms of increasing the number of projects and geographic range. Staff has limited capacity to follow current projects beyond 18 months or link participants from separate but related projects. At the time of this Report, the Program had just started working with Project Fellows, and it was too early to evaluate the extent to which they may expand Staff capacity. Following the completion of several projects associated with Project Fellows, Program Leadership might consider whether Project Fellows are able to expand capacity in a manner that allows for better project follow-up, results sharing, and increasing the number and range of projects.

The Program model may need to shift if the priority is to increase project numbers.

This assessment should consider whether U.S. based Project Fellows are able to effectively perform the same role for internationally based projects. If Project Fellows are insufficient to increase capacity, then Program Leadership may want to consider hiring additional Staff or using a different model (i.e., something akin to the Resilience Dialogues for projects where the goal is mainly information exchange). At the same time, the Program should ensure that project participants understand what services Staff can and cannot offer, so participants have more realistic expectations of what can be accomplished.

6.1.3. Program Commitment

Community participants are often engaged in advocacy for political and social change. Such participants may be frustrated when the Thriving Earth Exchange project is considered “completed” once scientific findings emerge, but no action has been taken in response to these findings. We recommend that the Program develop a code of ethics or written acknowledgement of the Program’s values (some of which may be interpreted as political, such as promoting equity) and clarify the extent to which the Program can or cannot assist community participants in achieving goals beyond increasing community science capacity (i.e., advocacy-related goals).

6.1.4. Relationships with Bridging Organizations

Matching communities with bridging organizations who specialize in advocacy may be a way to assist communities in their larger goals without requiring the Program to take a political or legal stance. Currently there is not a formal system for matching organizations with communities, in contrast to the system for soliciting and matching community leads, scientists, and Project Fellows. We recommend that Program Leadership establish such a system.²¹ If Program Staff lacks the knowledge base to make such matches, it could rely on a bridging organization that has knowledge of similar organizations to facilitate matches between communities and other bridging organizations. Leadership could also enter into more formal agreements with existing bridging organization partners to clarify roles (to the extent bridging organizations desire more formal roles). An agreement could be tailored to fit the particular circumstances related to a particular organization.

6.1.5. Project Funding

Funding is a challenge for individual projects as well as the Program as a whole. Recommendations regarding funding came up as a challenge more often than any other in surveys and interviews. One interviewee suggested that, in the absence of monetary assistance, the Program could have an equipment library for things that are commonly used for projects, like rain gauges. Several suggested using student volunteers as experts and coordinators.²²

It may benefit the Program to charge municipalities (or those able to pay) a small fee to participate.²³ Alternatively, participants may pay in-kind by undertaking work that

²¹ We recognize that some in Program Leadership would like to keep this informality. As suggested in interviews, this process could develop organically, rather than involve more formal agreements such as Memorandums of Understanding or Agreement.

²² Presumably, graduate students may be serving in this capacity as Project Fellows.

²³ The fee might be based on a sliding scale determined by ability to pay, or a percentage of money saved as a result of the project (although such a system could reduce the incentive to take on projects benefitting economically disadvantaged communities).

There is a need for clarity on the Program’s political stance, a better system to match with bridging organizations, and more stable project funding.

Program Staff may not have time to do (i.e., participate in evaluations, provide reports, or find ways to share learning with other participants).

If the Program expands its matching system to include bridging organizations, it may also want to consider matching communities with foundations or grant writers who can provide support with funding. Alternatively, the Program could provide participants with clear guidance from the beginning regarding the lack of funding and the need for participants to find their own funding.

6.2. Project Selection and Organization

OPPORTUNITIES FOR IMPROVEMENT: PROJECT SELECTION AND ORGANIZATION

We recommend developing a standard operating procedure for selecting projects, as well as for project organization.

The Program may want to vet potential scientist partners more carefully and offer an opportunity community and scientist participants to decide early in the process if they are a good match for each other.

6.2.1. Pre-Project Work

We recommend that the Program develop a standard operating procedure for selecting projects, through which the Program retains files of the process for future reference. The procedures should be communicated to prospective participants. The following is an outline of what a standard operating procedure could look like:

- The Program designates someone (i.e., a Staff member, Project Fellow, or Bridging Organization) to work with a prospective community participant prior to project selection. Through this process, the designated person helps the community better articulate its goal(s) and ensures that accomplishing the goal(s) in an 18-month timeframe (or whatever the maximum timeframe the Program sets) is feasible. During this time, it should be clear that the Program has not agreed to officially support the project.
- A selection committee appointed by Program Leadership determines whether the proposed project is a good match for the Program based on standardized criteria that may include the following: need for assistance; visibility; availability of community staff or volunteers to work on the project; the representativeness of the project proponent of the larger community; the likelihood of completion; the number of people who could be positively affected; and the likelihood of project benefits exceeding negative consequences.
- If the project is selected, the community is then matched with a scientist and perhaps a bridging organization.

6.2.2. Scientist Match

Scientists who participated in the Program tend to be either very satisfied or very disappointed with their projects, in contrast to communities, which have tended to be more satisfied. This suggests that it takes a special kind of scientist to participate in the Program—someone who is not concerned about publications and funding, and someone who is willing to lay aside their Western science presumptions to try to understand the community perspective. We recommend that the Program vet potential scientist partners to make sure

Standard operating procedures should be developed and communicated for project selection and implementation.

Not every scientist is a good candidate for the Thriving Earth Exchange Program.

that they understand the time commitment required and the nature of what can be gained by participation. There should be an opportunity for the community and the scientist to decide if they are a good match for each other (perhaps a trial period), after which time the partners commit to carrying out the project.

6.2.3. Project Organization

We recommend establishing standard operating procedures for project organization. These should be broad enough to ensure flexibility, but specific enough to increase the likelihood of meeting project goals. The following is an outline of what a standard operating procedure could look like:

- After the project’s trial period, assuming science, community, and bridging organizations are willing to commit to the project, they sign a project agreement clarifying the roles of each participant and refining the goals (if needed). The agreement does the following:
 - Clarifies what services the Program will and will not provide;
 - Outlines the timeline for achieving milestones and the time when Program support will end;
 - Incorporates best practices for communication between partners;
 - Explains circumstances in which participants could pull out of the project;
 - Explains how the community will address turnover in the staff or volunteers working on the project; and
 - Explains how the community might replace a scientist participant that has quit the project or ceases to be a good match for the community.
- The Community leader provides Program Staff with names and contact information of all who have a role in the project.
- When Program support ends (either because Program Staff considers the project completed or impossible to complete), the Program and participants should discuss what remains to be done and how they might accomplish this. In other words, how will community participants be “launched” to continue their work without the regular support of Program staff?

6.3. Evaluating Projects

OPPORTUNITIES FOR IMPROVEMENT: EVALUATING PROJECTS

The Program should maintain a participant tracking database that continues beyond the project timeline and require participants to share information with the Program at the beginning of their project, at the time the project is considered complete, and possibly 1-3 years after.

Currently there is not a system in place to follow projects after they are considered “complete” or to evaluate them, other than a survey that Program Staff sends post-project (which is not often completed). Nor is there a formal system for keeping track of participants’ contact information and maintaining records of project results. We recommend that the Program maintain a database that tracks all participant names and contact information as well as updates on projects. As an “in-kind” contribution, a community could commit (perhaps in its project agreement) to complete a survey at the time that Program involvement begins and ends, and then again after a certain amount of time (perhaps a year to three years).

At the time of the survey, contact information for participants could be updated if need-be. The Program could have an automated system to send the survey (or at least note on the calendar of Program Staff).

If the Program will continue marking projects as “completed” once the initial deliverable (i.e., data collection) is complete and Program Staff is no longer directly involved, the Program may want to continue tracking projects and participants after “completion” and assess when the participants consider the projects to be complete. This assessment could lead to a more detailed record of projects after Program involvement, with projects characterized by as “Successful,” “Partially Successful,” or “Unsuccessful” based on whether it has met the evaluation metrics.

We recommend that the Program more clearly identify metrics for project success, acknowledging that there may be different frames of reference for “success” and “benefit” depending on whether one is a community participant, scientist, or in Program Staff or Leadership. The Dashboard of Metrics suggested in Appendix A could serve as some potential future indicators for evaluation, and/or the Program could identify others. Metrics could be related to a community’s increased understanding and appreciation of science, relationships formed with and trust in scientists, and the application of science to address community concerns. While money a community saved as a result of a project could also be a metric, this will only be applicable to certain kinds of projects.

6.4. Sharing Information and Connecting Projects

OPPORTUNITIES FOR IMPROVEMENT: SHARING INFO AND CONNECTING PROJECTS

The Program should catalogue searchable information on projects and connect past and present participants (perhaps in a manner similar to social media).

The Program should hold quarterly meetings between nearby projects.

The Program currently has a website presenting highlights from each project and contact information for some participants, but not a searchable database to locate participants or information gained from projects. The Program is affiliated with AGU’s Community Science Connect social networking platform whose members include some Program participants. The Program could consider whether it could build on the Community Science Connect platform so that it could both catalog searchable information on projects and connect past and present participants (all of whom should be identified by the community-based project leader at the beginning of the project) in a manner similar to social media.

The Program could also consider quarterly meetings between nearby projects (such as those in southeast Louisiana), phone/internet meetings between nationwide projects working on similar issues, or a conference for Program participants outside of or parallel to the annual AGU meeting. This connectivity might not only encourage social learning, it could help address common problems and help people feel motivated/not alone. If Program Staff does not have the capacity to facilitate networks, this work might be undertaken by community participants as part of an in-kind contribution, or a bridging organization or university.

6.5. Visibility

OPPORTUNITIES FOR IMPROVEMENT: VISIBILITY OVERALL

The Program should consider rebranding itself to more clearly align with AGU.

Greater visibility of the Program could allow it to attract more volunteer scientists and Project Fellows, and potentially, more funding. Given the significantly greater visibility of AGU compared to the Thriving Earth Exchange, the Program should consider whether rebranding itself to more clearly align with AGU (i.e., “the AGU Community Science Program”) could be helpful.²⁴ The development of a platform that combines a searchable catalog of information garnered from projects,²⁵ and social media-like news and connectivity could help raise visibility. One survey participant suggested that project participant testimonials could raise visibility, explaining:

Much of the added value of the Thriving Earth Exchange is difficult to quantify with "traditional" metrics. I would like to see us capture some of this added value in the form of short video testimonials from participants in Thriving Earth Exchange projects in which they tell the world how they or their communities benefited from the interaction. These would give us a good deal of added visibility.

6.6. Considerations for International Projects

CONSIDERATIONS FOR INTERNATIONAL PROJECTS

International projects are more difficult to carry out than U.S.-based projects. Partnerships with grassroots organizations in the project areas may be helpful to address international country/location-specific challenges.

International projects pose particular challenges that the Program will want to consider, assuming it continues to expand internationally. Scientists and Project Fellows for a project in a particular country should have specific experience in that country or part of the world.²⁶ Partnerships with grassroots organizations in that country and international development funders²⁷ may be helpful.

²⁴ One survey participant cited the name of the Program as a potential obstacle to increasing visibility, noting that “Thriving Earth Exchange” doesn't tell anybody anything about what the Program is about, and suggesting “AGU Community Science Program” as an alternative.

²⁵ One survey participant suggested a publication by the American Association for the Advancement of Science (AAAS) as a guideline for raising visibility: “How We Respond: Stories of Community Response to Climate Change” (<https://howwerespond.aaas.org>).

²⁶ One interviewee from a developing country suggested that it was helpful that the project's science partner was also originally from a developing country and could understand the constraints of working in developing countries. Another interviewee cautioned the selection of Project Fellows in developing countries, suggesting that they might be too “elite” or isolated from local communities, such that grassroots groups in these countries (if they exist) would be more helpful.

²⁷ One interviewee suggested that the Program align with the international development aid community to get funding for international projects. Another interviewee noted that this would force

In contrast to U.S. based projects, increasing the number of international projects may require additional effort and consideration for the particular issues in a given country.

AGU to compete with groups already skilled in obtaining USAID and World Bank funding, and that such funding comes with many restrictions.

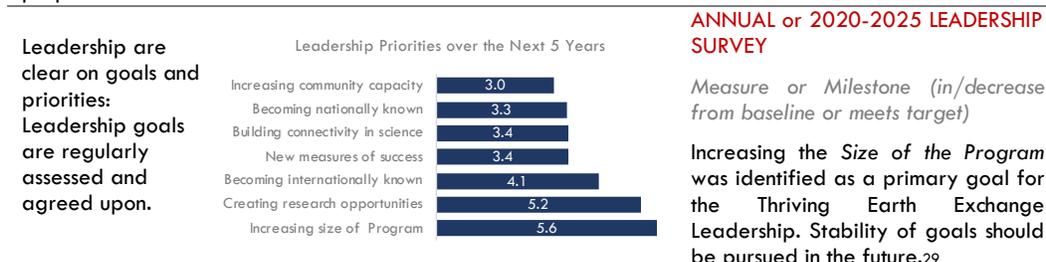
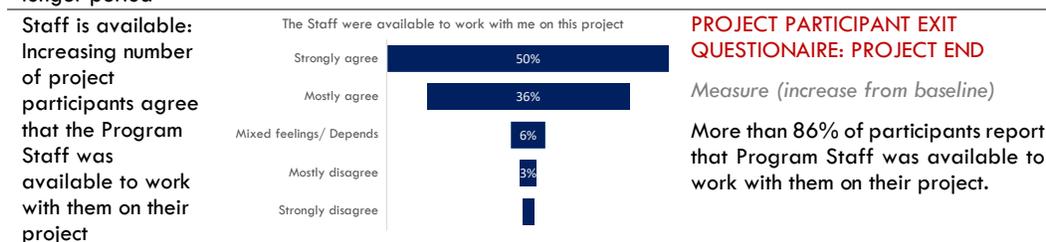
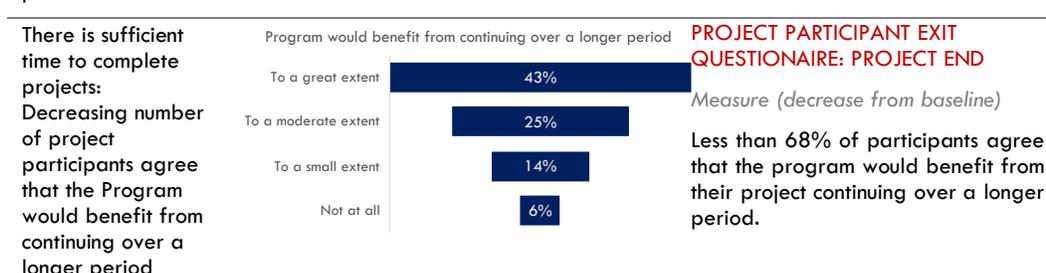
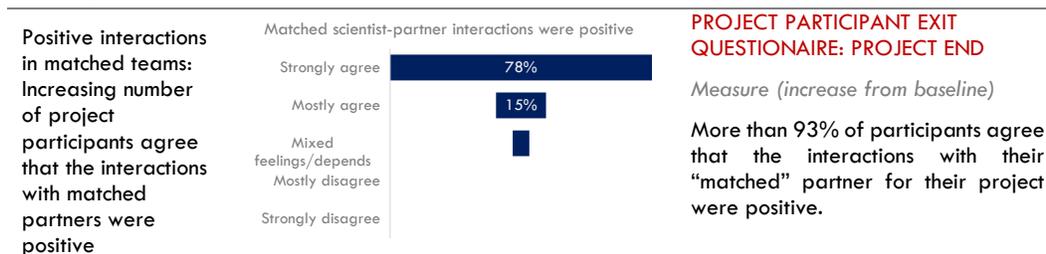
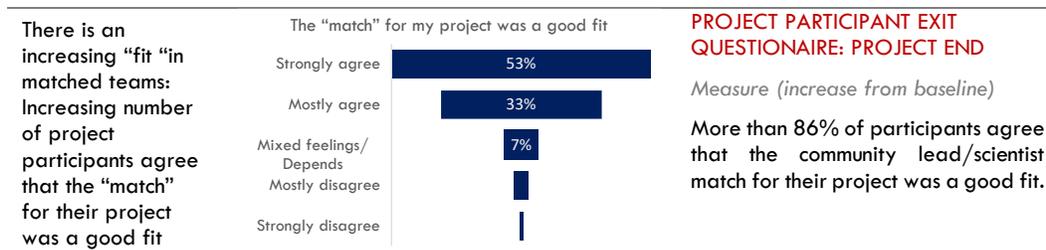
7. APPENDIX A: DASHBOARD FOR FUTURE TRACKING

This Dashboard gives a snapshot of indicators of Program progress and suggests metrics the Thriving Earth Exchange Program could use to assess its evolution in the future. These measures and milestones²⁸ are Program-based and participant-driven. They ensue from the Program-wide survey and can serve as baselines to improve upon. The measures and milestones suggested below assume that Program Leadership continues to move forward with the current model for projects, with similar levels of Staff and funding. If Program Leadership shifts to a different model (for example, one that devote more resources to a single project with fewer overall projects, or a model more like the Resilience Dialogues), these would need to be adjusted. Not all of these Indicators are suggested as suitable in future years, rather, they offer options for future Program progress tracking.

PROGRAM PROCESS

Indicator	2014-2019 Baseline (Status)	Future Assessment
Increasing number of new and completed projects per year: Increase over 2014-2019 baseline average	Increase over 2014-2019 Baseline Average	
	Initiated	13.7
	Completed	8.2
	Ongoing	3.8
	Incomplete	1.7
		YEARLY PROGRAM ASSESSMENT (STAFF) <i>Measure (increase from baseline)</i> More than 13.7 projects are initiated and at least 8.2 projects have completed each year. Less than 1.7 incomplete projects per year.
Participants' time is respected: Decreasing percentage of participants report that the project was too time consuming	Project was more time consuming than expected	
	Strongly agree	22%
	Mostly agree	26%
	Mixed feelings/ Depends	16%
	Mostly disagree	22%
	Strongly disagree	10%
		PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END <i>Measure (decrease from baseline)</i> Less than 48% of participants report that their project was more time consuming than expected each year. (More than 52% of participants find their project not time consuming)
Participants are available to work with one another: Increasing percentage of participants report that their project partners were available to work with them	My project partners were available to work with me	
	Strongly agree	47%
	Mostly agree	32%
	Mixed feelings/ Depends	15%
	Mostly disagree	
	Strongly disagree	4%
		PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END <i>Measure (increase from baseline)</i> More than 80% of participants report that project partners were available to work on each project each year.
Number of projects funded: Increasing number of projects are funded externally	Was your community science project funded?	
	Fully funded (ext. funds)	
	Part funded (ext. funds incl. Program)	4%
	Fully funded (by Program)	7%
	Part funded (ext. funds not Program)	11%
	Don't know/Not sure	19%
	Not funded	52%
		PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END <i>Measure (increase from baseline)</i> This goal is dependent upon Program priorities. Under current rationale, more than 48% of projects should be externally funded.

²⁸ A measure of success is a quantitative (numerical) way of expressing whether (or to what extent) an objective has been reached. A milestone includes a target and expressed in a qualitative way (met or not met) progress toward an objective (e.g. accomplishing a specific defined action).



PARTICIPANT OUTCOMES

Indicator	2014-2019 Baseline (Status)	Future Data Collection
Increasing number and diversity of Program participants involved each year	NO DATA YET	PROJECT PARTICIPANT ENTRANCE QUESTIONNAIRE PRE-PROJECT
	Based upon future participant entrance questionnaires accumulated before projects start: Diversity of Program participants (race, gender, and possibly, community location or socio-economic status).	Measure or Milestone (in/decrease from baseline or meets target) Increasing number of participants belonging to an underrepresented group or community (% TBD)

²⁹ Thriving Earth Exchange might revisit its goals in the future and increasing the size of the Program may or may not be a top priority in the near future.

Increasing community confidence in doing science: Increasing number of participants feel more confident to understand challenges in their local community	More confidence using science		<p>PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END</p> <p><i>Measure (increase from baseline)</i></p> <p>More than 83% of participants agree that they are now more confident in doing science to understand challenges in their communities.</p>
	Strongly agree	50%	
	Mostly agree	33%	
	Mixed feelings/Depends	15%	
	Strongly disagree		

BROADER COMMUNITY IMPACT

Indicator	2014-2019 Baseline (Status)	Future Data Collection
Increasing number of project outputs: Increasing number of project participants report having any project outputs	Any specific "output" derived from your project?	
	Yes	73%
	Don't know/Not Sure	16%
	No	
		<p>PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END</p> <p><i>Measure (increase from baseline)</i></p> <p>More than 73% of all projects report having some sort of output at the end of their project.</p>

Increasing reach of project outputs: Outputs derived from projects are increasingly shared publicly	Project "output" after the project ended		<p>PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END</p> <p><i>Milestone (meets target)</i></p> <p>A minimum of 89% of projects will share outputs with members of their community.</p>
	Will be presented at a community meeting/event	33%	
	Will be made available to the public	32%	
	Will be made available to select project participants	24%	
	The scientist/researcher has kept it	8%	
	Nothing has or will happen	3%	

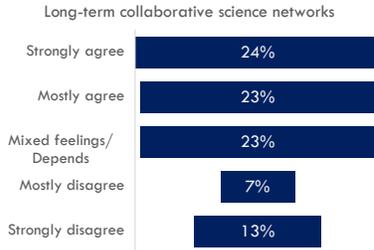
Increased awareness of program: Increased breadth of project awareness	Who is aware of your project?		<p>PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END</p> <p><i>Measure (increase from baseline)</i></p> <p>More than 75% of participants report that people other than people directly working on their project have been aware of their project</p>
	The whole community or neighborhood	6%	
	People in and beyond the community	15%	
	The community's local government	17%	
	Some people in the community/ neighborhood	18%	
	Members of a community group	19%	
	People directly working on the project	25%	

Increasing number of scholarly outputs: Increasing number of scholarly articles, posters or presentations at a conference	Project has resulted in a scholarly output		<p>PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END</p> <p><i>Measure (increase from baseline)</i></p> <p>More than 76% of projects have been able to publish a scholarly paper, or present at a conference.</p>
	Yes	37%	
	No	24%	
	Presentations at a conference	21%	
	We plan to publish in the future	18%	

SUSTAINABILITY OF THE PROGRAM

Indicator	2014-2019 Baseline (Status)	Future Data Collection
Increasing number of collaborators: Increasing average number of participants are engaged in projects each year	Increasing Average Number of Collaborators	
	United States Collaborators	38
	International Collaborators	5
	Bridging Organization	7
		<p>PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END</p> <p><i>Milestone (meets target)</i></p> <p>More than 38 U.S.-based; 5 International; and 7 Bridging Organization collaborators each year</p>

Increasing number of long-term collaborative science networks are established: Increasing number participants report having established long-term collaborative science networks

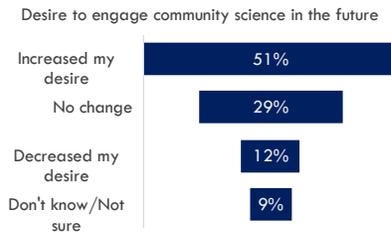


PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END

Measure (increase from baseline)

More than 47% of project participants report that working on their project enabled them to establish long-term collaborative science networks.

Increasing desire to engage in future community science projects: Increasing number of participants report they have greater desire to engage in community science in the future



PROJECT PARTICIPANT EXIT QUESTIONNAIRE: PROJECT END

Measure (increase from baseline)

More than 80% of project participants either report that their experience increased their desire to engage in community science in the future or that the experience did not change their desire to engage (as their interest might have already been high).

8. APPENDIX B: ABBREVIATED SURVEY RESULTS

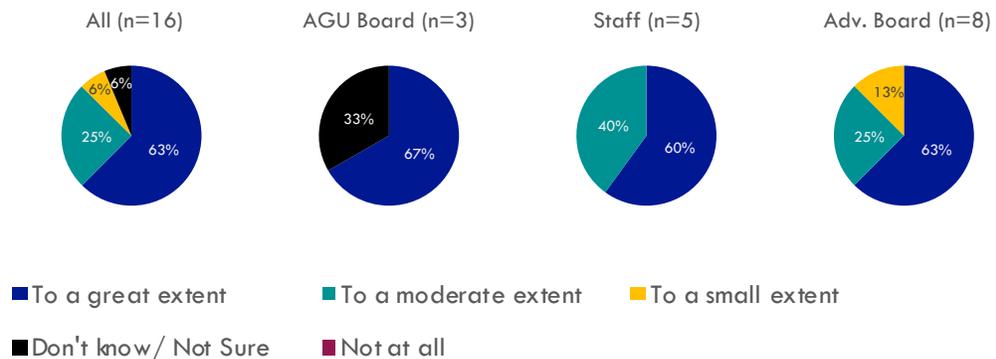
An electronic survey was sent to 402 current and past Thriving Earth Exchange participants (including The Resilience Dialogues) on September 10 with two follow-up reminders sent on September 15, and September 23, 2019. A total of 120 responses were received and the survey closed on October 7, 2019. The Table below breaks down response rates by group of participants in the Program. This appendix outlines questions and responses received.

Group	Total Contacted	Total Respondents	Response Rate (%)
Leadership and Staff	34	17	50.0%
Community Participants	172	48	27.9%
<i>Project Community Liaisons</i>	118	41	23.8%
<i>Resilience Dialogues Community</i>	54	7	4.1%
Scientists	196	55	28.1%
<i>Project Scientists</i>	112	48	24.5%
<i>Resilience Dialogues Scientists</i>	84	7	3.6%
TOTAL	402	120	29.9%

Questions Asked Solely to Program Leadership

To what extent do you feel the Thriving Earth Exchange Program is currently meeting its goals?

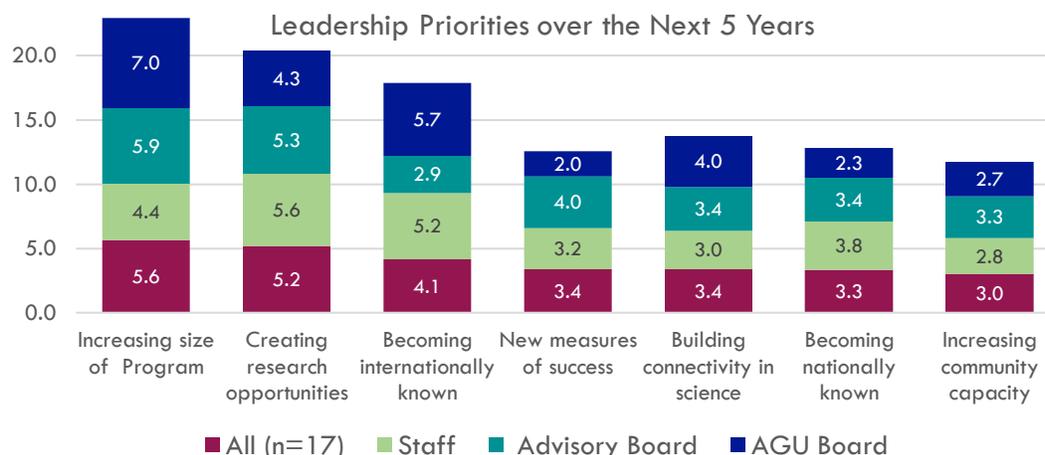
	All (n=16)	AGU Board (n=3)	Staff (n=5)	Advisory Board (n=8)
To a great extent	63%	67%	60%	63%
To a moderate extent	25%	0%	40%	25%
To a small extent	6%	0%	0%	13%
Don't know/ Not Sure	6%	33%	0%	0%
Not at all	0%	0%	0%	0%



In your opinion, what Thriving Earth Exchange accomplishments should be prioritized over the next 5 years?

	All (n=17)	AGU Board (n=3)	Staff (n=5)	Advisory Board (n=9)
Increasing size of Program	5.6	7.0	4.4	5.9
Creating research opportunities	5.2	4.3	5.6	5.3
Becoming internationally known	4.1	5.7	5.2	2.9
New measures of success	3.4	2.0	3.2	4.0
Building connectivity in science	3.4	4.0	3.0	3.4
Becoming nationally known	3.3	2.3	3.8	3.4
Increasing community capacity	3.0	2.7	2.8	3.3
Number of Respondents	17	3	5	9

Note: Tabulated as average rank values.

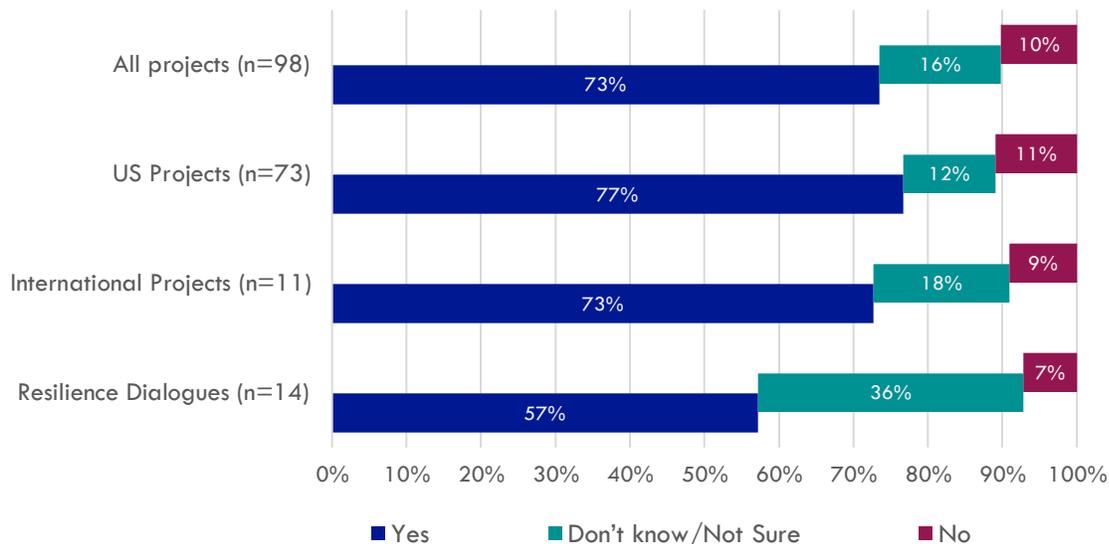


Questions Asked to Project Participants Only (Scientists and Community Members, including Resilience Dialogues Participants)

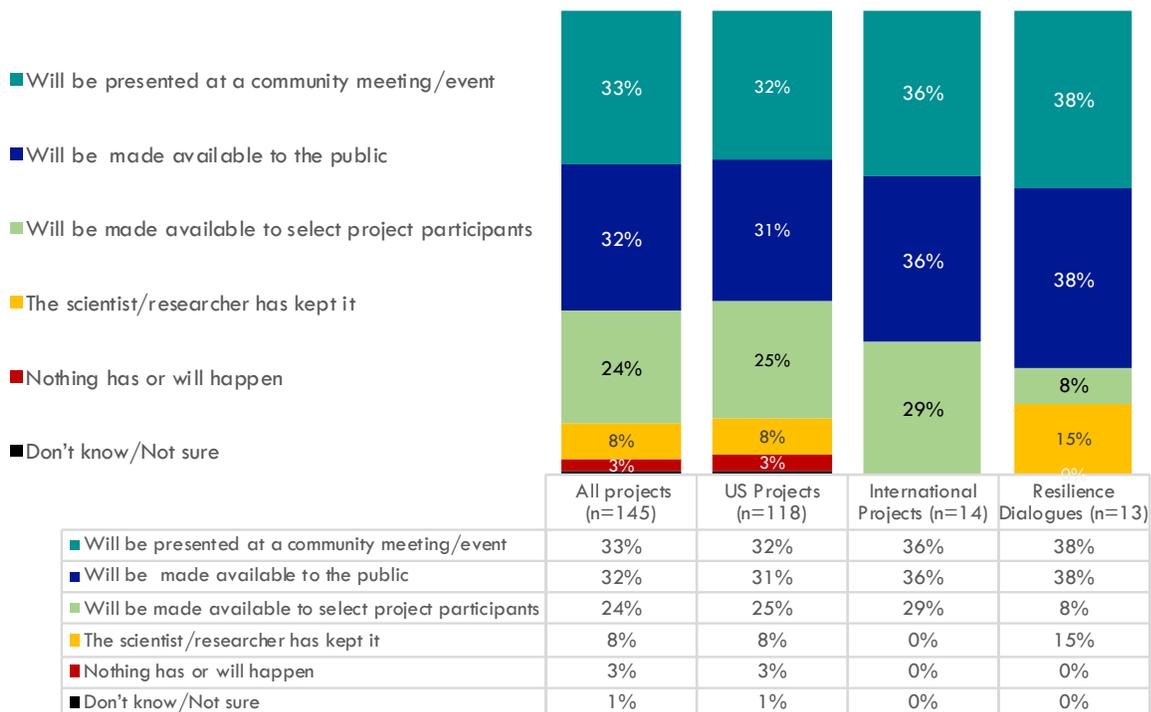
Was your community science project funded?

	Intl. Projects (n=11)	US Projects (n=73)	Resil. Dlg (n=14)	All projects (n=98)
Yes, fully funded by a grant from someone else	9%	3%	0%	3%
Partially funded by one or more grants from one or more sources (including Program)	9%	3%	0%	3%
Yes, fully funded through community's own funds	0%	4%	7%	4%
Yes, fully funded by Thriving Earth Exchange Program	0%	8%	7%	7%
Partially funded by one or more grants from one or more sources (but not Program)	18%	10%	14%	11%
Don't know/Not sure	9%	14%	57%	19%
Not funded	55%	59%	14%	52%

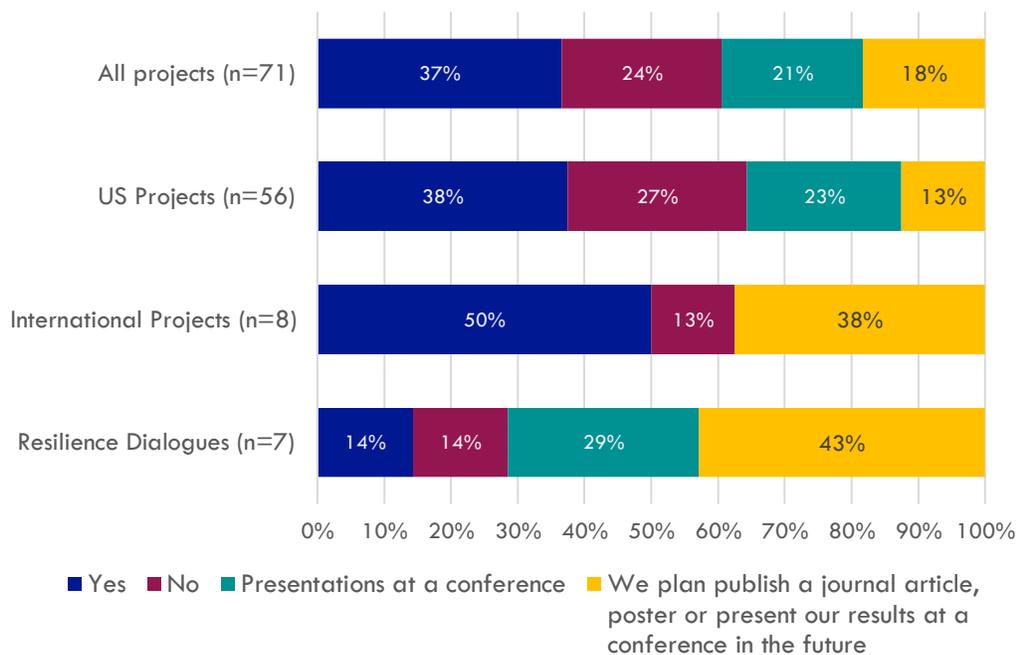
Was there or is there any specific “output” derived from your project (for example, a map, a plan, a policy, community/public information, a scientific data set, etc.)?



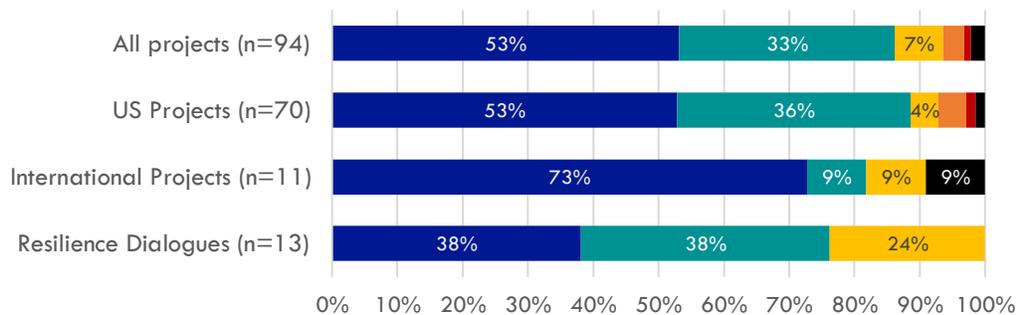
What will or has happened to your project “output” after the project ends(ed)? (SELECT ALL THAT APPLY)



Has or will the project result in scholarly articles, posters or presentations at a conference?



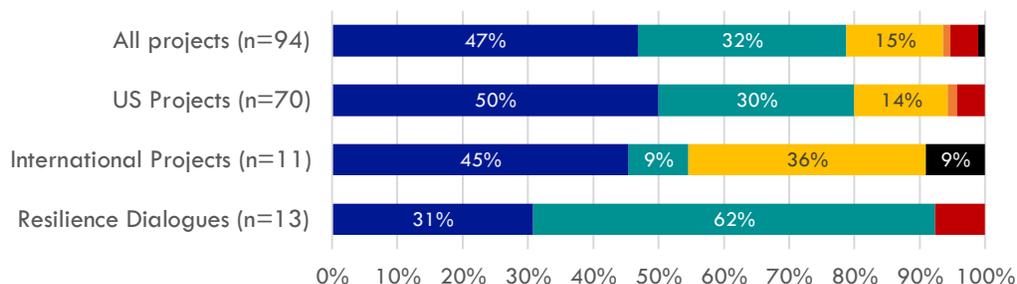
**Please tell us about the degree to which you agree with this statement:
The community/ scientist “match” for my project is/was a good fit:**



	Resilience Dialogues (n=13)	International Projects (n=11)	US Projects (n=70)	All projects (n=94)
Strongly agree	38%	73%	53%	53%
Mostly agree	38%	9%	36%	33%
Mixed feelings/ Depends	24%	9%	4%	7%
Mostly disagree	0%	0%	4%	3%
Strongly disagree	0%	0%	1%	1%
Don't know/Not sure	0%	9%	1%	2%



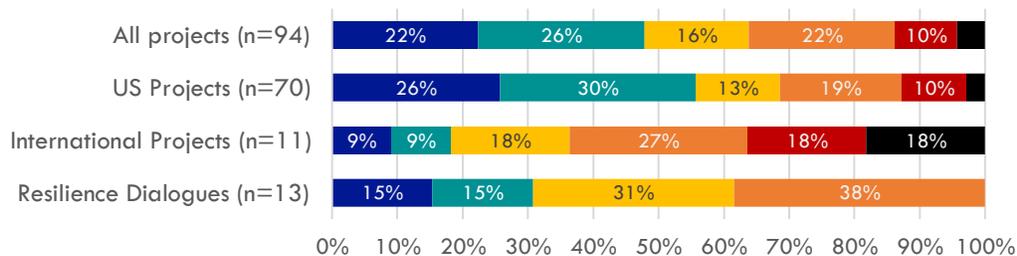
Please tell us about the degree to which you agree with this statement: My “matched” community/scientist project partner(s) are/were available to work with me on this project



	Resilience Dialogues (n=13)	International Projects (n=11)	US Projects (n=70)	All projects (n=94)
Strongly agree	31%	45%	50%	47%
Mostly agree	62%	9%	30%	32%
Mixed feelings/ Depends	0%	36%	14%	15%
Mostly disagree	0%	0%	1%	1%
Strongly disagree	8%	0%	4%	4%
Don't know/Not sure	0%	9%	0%	1%

- Strongly agree
- Mostly agree
- Mixed feelings/ Depends
- Mostly disagree
- Strongly disagree
- Don't know/Not sure

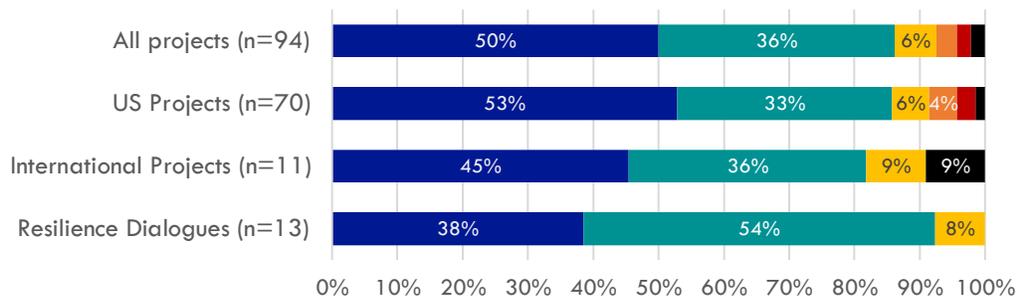
Please tell us about the degree to which you agree with this statement: The project I am/was working on is/was more time-consuming than I expected?



	Resilience Dialogues (n=13)	International Projects (n=11)	US Projects (n=70)	All projects (n=94)
Strongly agree	15%	9%	26%	22%
Mostly agree	15%	9%	30%	26%
Mixed feelings/ Depends	31%	18%	13%	16%
Mostly disagree	38%	27%	19%	22%
Strongly disagree	0%	18%	10%	10%
Don't know/Not sure	0%	18%	3%	4%

- Strongly agree
- Mostly agree
- Mixed feelings/ Depends
- Mostly disagree
- Strongly disagree
- Don't know/Not sure

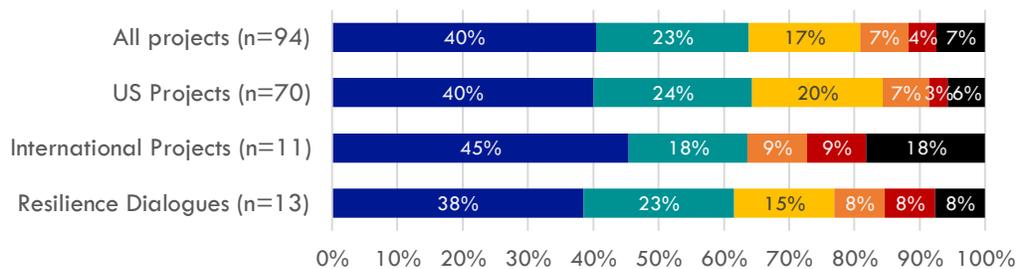
Please tell us about the degree to which you agree with this statement: The Thriving Earth Exchange Staff are/were available to work with me on this project?



	Resilience Dialogues (n=13)	International Projects (n=11)	US Projects (n=70)	All projects (n=94)
Strongly agree	38%	45%	53%	50%
Mostly agree	54%	36%	33%	36%
Mixed feelings/ Depends	8%	9%	6%	6%
Mostly disagree	0%	0%	4%	3%
Strongly disagree	0%	0%	3%	2%
Don't know/Not sure	0%	9%	1%	2%

- Strongly agree
- Mostly agree
- Mixed feelings/ Depends
- Mostly disagree
- Strongly disagree
- Don't know/Not sure

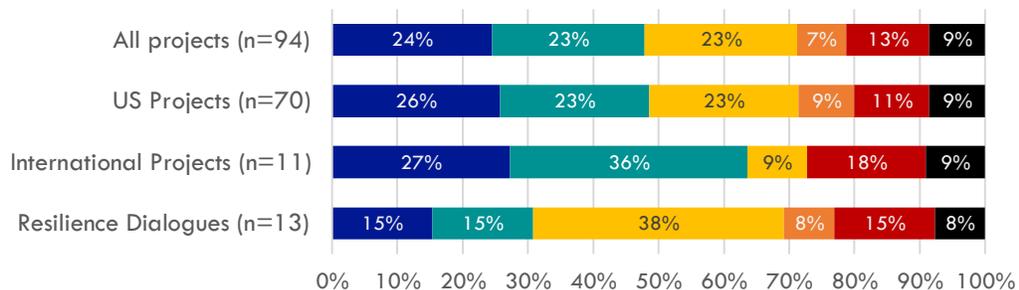
Please tell us about the degree to which you agree with this statement: I have been able to share my community science experience with others



	Resilience Dialogues (n=13)	International Projects (n=11)	US Projects (n=70)	All projects (n=94)
Strongly agree	38%	45%	40%	40%
Mostly agree	23%	18%	24%	23%
Mixed feelings/ Depends	15%	0%	20%	17%
Mostly disagree	8%	9%	7%	7%
Strongly disagree	8%	9%	3%	4%
Don't know/Not sure	8%	18%	6%	7%

- Strongly agree
- Mostly agree
- Mixed feelings/ Depends
- Mostly disagree
- Strongly disagree
- Don't know/Not sure

**Please tell us about the degree to which you agree with this statement:
The community science project I am/was working on enables(d) me to establish long-term collaborative science networks**



	Resilience Dialogues (n=13)	International Projects (n=11)	US Projects (n=70)	All projects (n=94)
Strongly agree	15%	27%	26%	24%
Mostly agree	15%	36%	23%	23%
Mixed feelings/ Depends	38%	9%	23%	23%
Mostly disagree	8%	0%	9%	7%
Strongly disagree	15%	18%	11%	13%
Don't know/Not sure	8%	9%	9%	9%



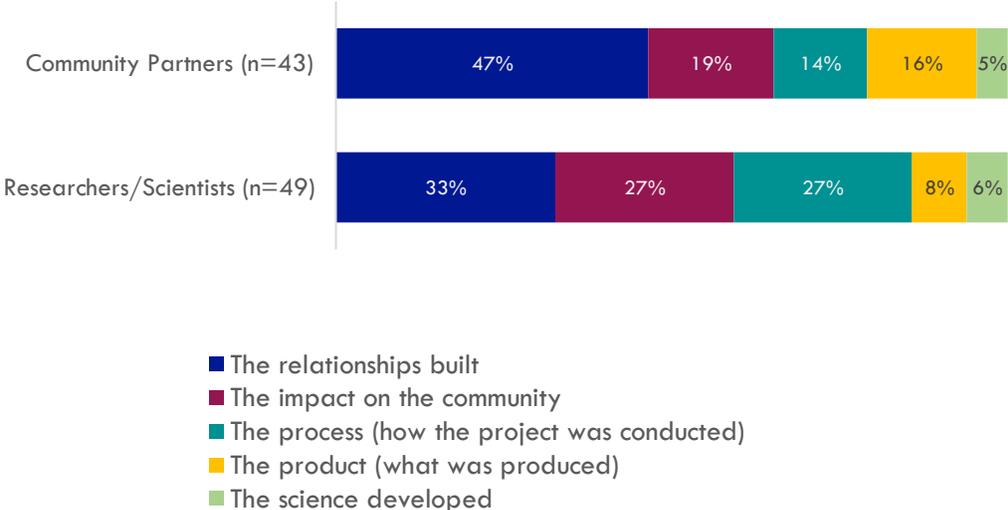
How has this experience affected your desire to engage in future community science projects?

	International (n=11)	US Projects (n=70)	Resilience Dialogues (n=13)	All projects (n=94)
Increased my desire	64%	49%	54%	51%
No change	18%	31%	23%	29%
Decreased my desire	18%	9%	23%	12%
Don't know/Not sure	0%	11%	0%	9%



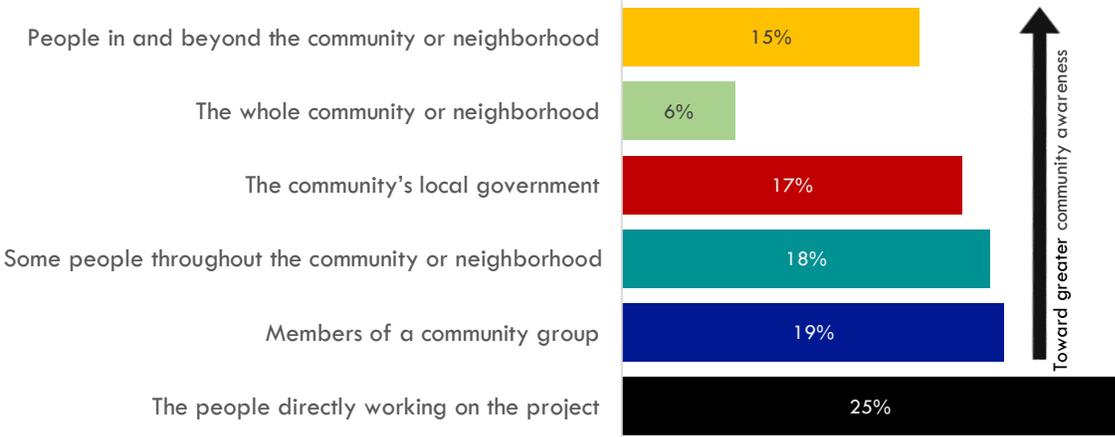
Questions Asked to Project Participants Only (Scientists and Community Members of Thriving Earth Exchange Projects – Not including Resilience Dialogues Participants)

In your opinion, what was the most successful part of your community-science project?



Questions Asked to Community Participants Only

Please identify who you think may have been or is aware of your project? (SELECT ALL THAT APPLY) (n=43)



To what extent do you feel your interactions with your matched scientist-partner(s) were positive? (n=43)

	Percent
Strongly agree	78%
Mostly agree	15%
Mixed feelings/depends	5%
Mostly disagree	0%
Strongly disagree	0%
Don't know/Not sure	3%

Please let us know the extent to which you agree with this statement: I feel more confident using science to understand and address challenges and problems in my local community/environment.

	Percent
Strongly agree	50%
Mostly agree	33%
Mixed feelings/Depends	15%
Mostly disagree	0%
Strongly disagree	0%
Don't know/Not sure	3%

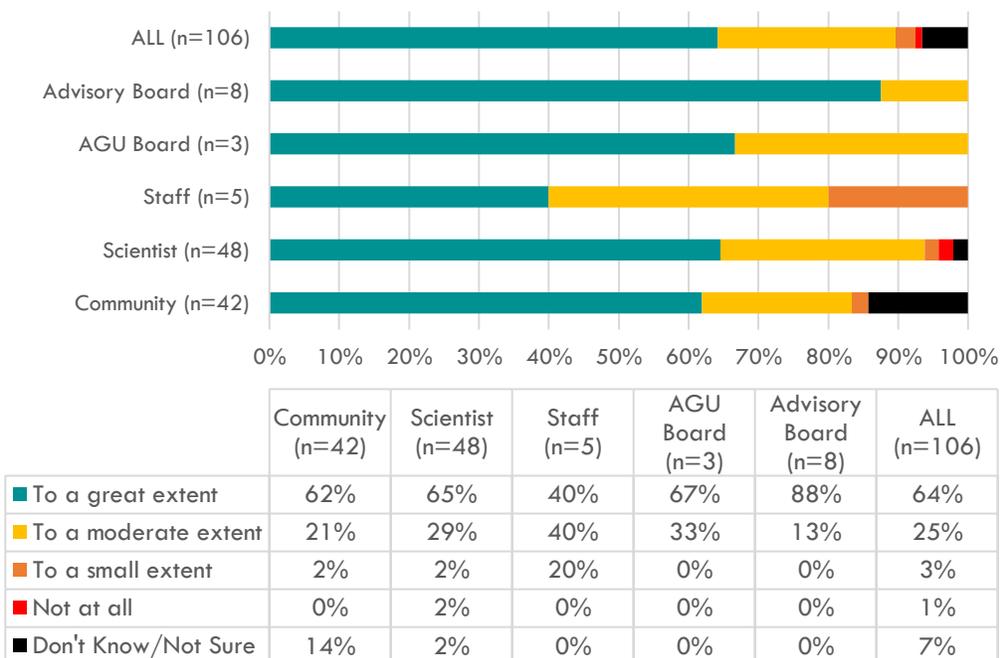
Questions Asked of all Program Participants (including Leadership, Projects and Resilience Dialogues Scientists and Community participants)

My current or most recent role in the Thriving Earth Exchange Community Science Program is:

Role	Frequency	Percent
AGU Board Member (and not a T.E.E. Adv. Board Member)	3	2.50%
Community Liaison (i.e., the lead person(s) for the project)	48	40.00%
Researcher/Scientist	55	45.83%
Thriving Earth Exchange Staff	5	4.17%
Thriving Earth Exchange Advisory Board Member	9	7.50%
TOTAL RESPONDENTS	120	100%

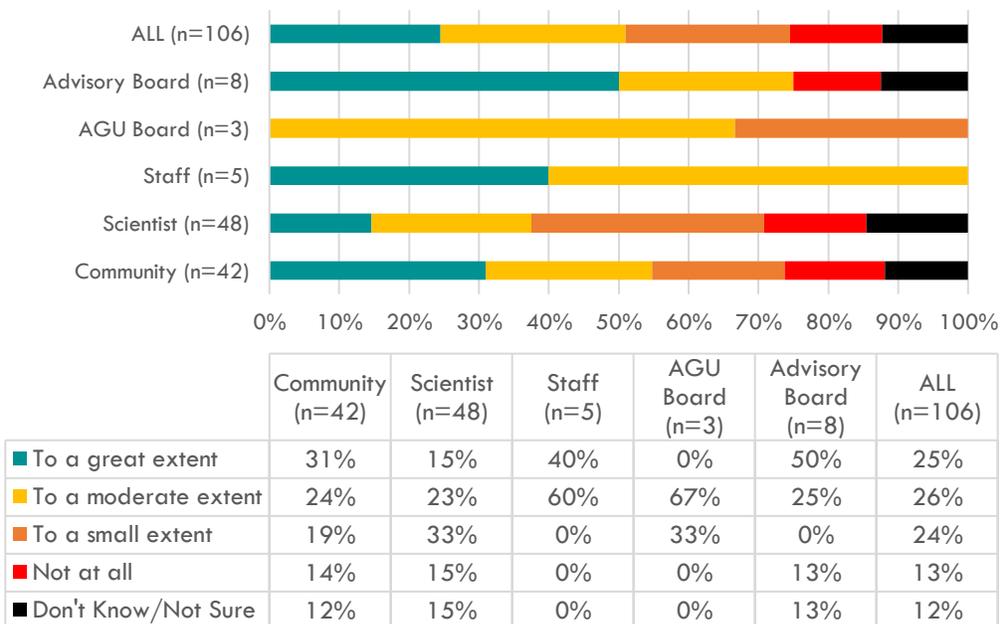
To what extent do you believe that future Thriving Earth Exchange projects would benefit from: A dedicated source of funding?

The Program would benefit from a dedicated source of funding



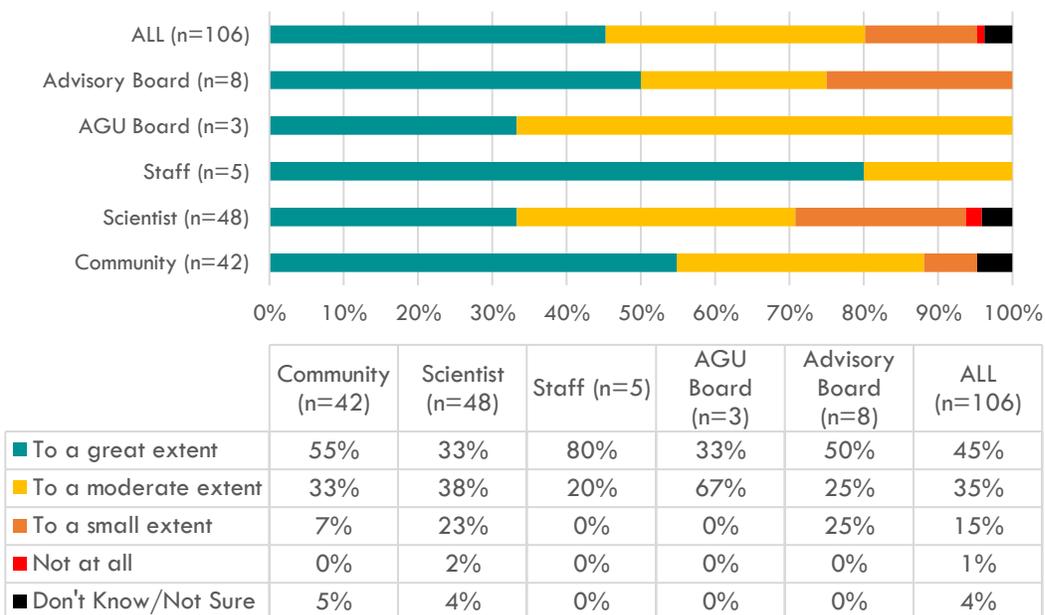
To what extent do you believe that future Thriving Earth Exchange projects would benefit from: More Thriving Earth Exchange Staff time or additional Staff?

The Program would benefit from additional staff or staff time



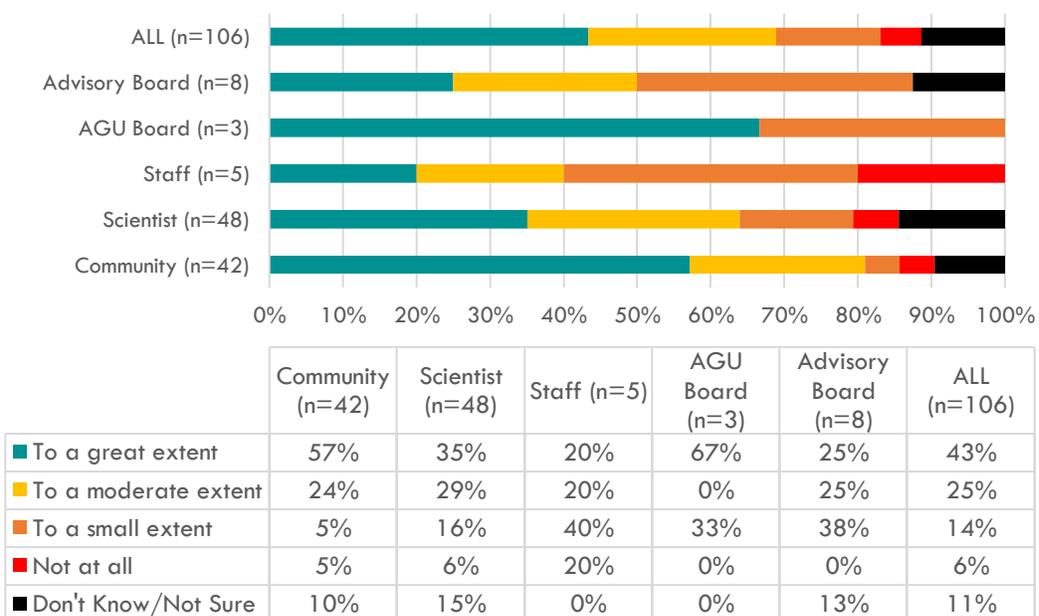
To what extent do you believe that future Thriving Earth Exchange projects would benefit from: Expertise from non-earth science experts (i.e. communications, political scientists, lawyers, grant writers)?

The Program would benefit from expertise from non-earth science experts



To what extent do you believe that future Thriving Earth Exchange projects would benefit from: Continuing over a longer period?

The Program would benefit from continuing over a longer period



9. APPENDIX C: SURVEY INSTRUMENT



Thriving Earth Exchange Program Assessment Survey

Thriving Earth Exchange Program Assessment Survey

Thank you for taking the time to take this anonymous survey. We are independent evaluation consultants retained to assess the Thriving Earth Exchange Program. Please let us know what has worked, or what has been challenging to you, as staff, leadership and/or community partner on various projects. Individual responses (names, project, identifying demographics, etc.) will NOT be shared with Program Admin - just overall results, lists of comments etc. (no one at Thriving Earth Exchange will know who said what).

Thriving Earth Exchange Staff and Board are interested in using the results to highlight effective Program practices and identify areas and strategies for improvement. The results of the assessment will also be shared with the AGU Board to help them in their oversight and fiscal support of the Thriving Earth Exchange Program.

This survey should take about 15 minutes of your time. Please feel free to contact either of us via email (Sara Bolduc (sbolduc@hawaii.edu) and Barrett Ristroph (ebriastroph@gmail.com)) should you have any questions or are having difficulty taking the survey. Thank you! We greatly appreciate your input.

Press "Next" to get started!



Thriving Earth Exchange Program Assessment Survey

Tell us who you are

* 1. My current or most recent role in the Thriving Earth Exchange Community Science Program is

- Thriving Earth Exchange Staff
- Thriving Earth Exchange Advisory Board Member
- AGU Board Member (and not a Thriving Earth Exchange Board Member)
- Researcher/Scientist SKIP TO Q4
- Community Liaison (i.e., the lead person(s) for the project) SKIP TO Q4

Thriving Earth Exchange Program Assessment Survey

Thriving Earth Exchange/AGU Advisory Boards and Staff

* 2. To what extent do you feel the Thriving Earth Exchange Program is currently meeting its goals?

- To a great extent
- To a moderate extent
- To a small extent
- Not at all
- Don't know/Not sure

* 3. In your opinion, what Thriving Earth Exchange accomplishments should be prioritized over the next 5 years? Please rank these potential accomplishments in order of importance with one (1) being the most important, and seven (7) being the least important.

- Becoming nationally known for community-science partnerships
- Becoming internationally known for community-science partnerships
- Demonstrating measures of scientific success in other ways than in peer-reviewed journals and conference presentations
- Creating new opportunities for scientific research
- Building connectivity among partners in science
- Increasing community capacity to use science
- Increasing the size of for the Program

SKIP TO Q19 after questions for all answers



Thriving Earth Exchange Program Assessment Survey

Project participants: Community Liaisons and Scientists

* 4. What type of Thriving Earth Exchange community science project did you/or are you participate(ing) in?
(If you participated in more than one project, please select the one you most recently participated in)

- A project based in the United States (but not the Resilience Dialogues)
- A project based in a community outside of the United States
- The Resilience Dialogues

* 5. Was your community science project funded?

- Yes, fully funded by Thriving Earth Exchange
- Yes, fully funded through community's own funds
- Yes, fully funded by a grant from someone else
- Partially funded by one or more grants from one or more sources (including Thriving Earth Exchange)
- Partially funded by one or more grants from one or more sources (but not Thriving Earth Exchange)
- Not funded
- Don't know/Not sure

Please feel free to share any additional thoughts you may have about your project funding, if any

* 6. What is the status of the project you are working on (or worked on)?

- Completed
- Ongoing
- We completed our initial project and are now expanding it/working on a similar project
- We never completed our project (the project has ceased)

Please feel free to tell us more about your project's status

* 7. Was there or is there any specific "output" derived from your project (for example, a map, a plan, a policy, community/public information, a scientific data set, etc.)?

- Yes
- No SKIP TO Q10
- Don't know/Not Sure SKIP TO Q10



Thriving Earth Exchange Program Assessment Survey

* 8. What will or has happened to your project “output” after the project ends(ed)? (SELECT ALL THAT APPLY)

- Project results/findings will/were presented at a community meeting or similar community event
- Output was or will be made available to select project participants in the community
- Output was or will be made available to the public
- The scientist/research partner will keep or has kept the output
- Nothing has or will happen with the output
- Don't know/Not sure

Other (please specify)

* 9. Has or will the project result in scholarly articles, posters or presentations at a conference?

- Yes
- No
- We plan publish a journal article, poster or present our results at a conference in the future
- Don't know/Not Sure



Thriving Earth Exchange Program Assessment Survey

* 10. Please tell us about the degree to which you agree with each of these statements

	Strongly agree	Mostly agree	Mixed feelings/ Depends	Mostly disagree	Strongly disagree	Don't know/Not sure
The community/scientist "match" for my project is/was a good fit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My "matched" community/scientist project partner(s) are/were available to work with me on this project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The project I am/was working on is/was more time-consuming than I expected?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Thriving Earth Exchange Staff are/were available to work with me on this project?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have been able to share my community science experience with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The community science project I am/was working on enables(d) me to establish long-term collaborative science networks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 11. How has this experience affected your desire to engage in future community science projects?

- Increased my desire
- Decreased my desire **SKIP TO Q13**
- No change **SKIP TO Q14**
- Don't know/Not sure **SKIP TO Q14**



Thriving Earth Exchange Program Assessment Survey

12. Why has this experience increased your desire to engage in future community science projects?



Thriving Earth Exchange Program Assessment Survey

13. Why has this experience decreased your desire to engage in future community science projects?



Thriving Earth Exchange Program Assessment Survey

* 14. In your opinion, what was the most successful part of your community-science project?

- The process (how the project was conducted)
- The product (what was produced)
- The relationships built
- The science developed
- The impact on the community

Other (please specify)

* 15. The next three questions seek additional input from community leads/members. Are you a Thriving Earth Exchange project community lead/member?

- Yes
- No SKIP TO Q19

Thriving Earth Exchange Program Assessment Survey

Community Leads

* 16. To what extent do you feel your interactions with your matched scientist-partner(s) were positive?

- Strongly agree
- Mostly agree
- Mixed feelings/depends
- Mostly disagree
- Strongly disagree
- Don't know/Not sure

* 17. Please identify who you think may have been or is aware of your project? (SELECT ALL THAT APPLY)

- The people directly working on the project
- Members of a community group
- Some people throughout the community or neighborhood
- The community's local government
- The whole community or neighborhood
- People in and beyond the community or neighborhood

Other (please specify)

* 18. Please let us know the extent to which you agree with this statement: I feel more confident using science to understand and address challenges and problems in my local community/environment.

- Strongly agree
- Mostly agree
- Mixed feelings/Depends
- Mostly Disagree
- Strongly disagree
- Don't know/Not sure



Thriving Earth Exchange Program Assessment Survey

Advisory Boards, Staff, Scientists and Community Members

* 19. To what extent do you believe that future Thriving Earth Exchange projects would benefit from:

	To a great extent	To a moderate extent	To a small extent	Not at all	Don't know/Not sure
A dedicated source of funding	<input type="radio"/>				
More Thriving Earth Exchange staff time or additional staff	<input type="radio"/>				
Expertise from non-earth science experts (i.e. communications, political scientists, lawyers, grant writers)	<input type="radio"/>				
Continuing over a longer period	<input type="radio"/>				

20. Do you have any specific recommendation(s) about how the Thriving Earth Exchange Community Science Program could be more successful in the future?



Thriving Earth Exchange Program Assessment Survey

Thriving Earth Exchange is committed to advancing equity and ensuring that all communities have the opportunity to participate in, contribute to, and benefit from the Program. They seek information about participants' gender identity and race/ethnicity in order to see if they are living up to their aspirations for equity. This information is being collected by evaluators and will be shared with Thriving Earth Exchange staff only in aggregate to point out broad patterns - responses to these questions will not be shared with Thriving Earth Exchange in ways that will reveal your identity.

21. What is your gender identity?

22. What is your preferred description of your race/ethnic background?

THANK YOU! WE SINCERELY APPRECIATE YOUR TIME AND INSIGHTS.

Sara Bolduc and Barrett Ristroph