

# Moving from faith-based to tested adaptation process and approach: How will we know we're adapting?

Hoffman, J.R. and L.J. Hansen

March 2022



# Table of Contents

<b>BACKGROUND</b>	<b>2</b>
Box 1: Terminology	5
Box 2: Applying a Theory of Change approach to adaptation M&E	3
<b>MODELS FOR EVALUATION THAT EXIST TO DATE</b>	<b>6</b>
<b>HOW TO MEASURE SUCCESS</b>	<b>8</b>
Who will use the information, how and for what purposes?	8
When and how indicators, metrics, and the M&E plan are developed	10
Types of indicators	10
Enabling conditions for adaptation monitoring and evaluation	11
<b>HOW CAN SUCCESS BE MEASURED AT EACH OF THE STEPS TO RESILIENCE?</b>	<b>12</b>
<b>HOW CAN SUCCESS BE MEASURED ACROSS SITES?</b>	<b>19</b>
<b>PROPOSED PATH FORWARD</b>	<b>20</b>
<b>BOX 3: Example of M&amp;E for adaptation efficacy in Housing</b>	<b>22</b>
TABLE 1: Measuring Success by Step to Resilience	24
TABLE 2a: Measuring StR Success by Comprehensive Plan Element- Part 1	28
TABLE 2b. Measuring StR Success by Comprehensive Plan Element- Part 2	31
<b>LITERATURE CITED</b>	<b>34</b>
<b>APPENDIX A. Climate Adaptation Communications Plan</b>	<b>38</b>
<b>APPENDIX B. M&amp;E for the Climate Smart Community Initiative (CSCI)</b>	<b>41</b>
Box 4: What does M&E mean for...	41

Acknowledgments: Funding for this document was provided by the Climate Resilience Fund, in support of the U.S. Climate Resilience Toolkit, as an input to the Steps to Resilience Practitioners Guide.

**Suggested citation:** Hoffman, J.R. and L.J. Hansen. 2022. Moving from faith-based to tested adaptation process and approach: How will we know we're adapting? Adaptation Insight and EcoAdapt.

## BACKGROUND

This paper focuses on how the field of adaptation can shift from practices built on assumptions to practices built on evidence and deliberation. Doing so requires the systematic collection of information and the use of that information to support analysis and learning around when, where, why, and how to implement adaptation programs and projects, as well as who defines, implements, and benefits from adaptation action. In other words, the field of adaptation would benefit from increased and informed use of indicators, metrics, monitoring, and evaluation (Box 1).

Early climate change work focused on reducing greenhouse gas emissions (mitigation), which is conceptually simpler than climate change adaptation (CCA) and has common metrics used across most mitigation projects. Although recognition of the need for adaptation has been growing in recent decades, there is still no consensus on what constitutes successful CCA (e.g., Bours et al. 2014a, Christensen and Martinez 2018, Singh et al. 2021). Some definitions of adaptation focus on reducing vulnerability to climate change impacts, for example, while others focus on increasing resilience, which may be less specifically tied to climate-related hazards. Even if the focus is on reducing vulnerability, there are multiple climate vulnerability concepts and no common metric or set of metrics for measuring vulnerability. Without a common definition, it is difficult to have common metrics of success!

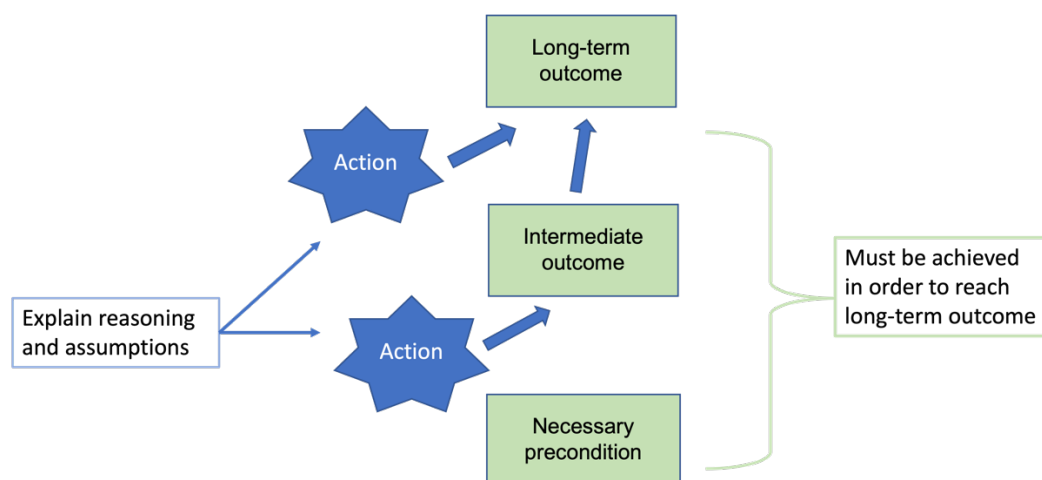


Figure 1. A generic theory of change. After Bours et al. 2014b.

One of the most commonly cited challenges when it comes to CCA monitoring and evaluation is that the effectiveness of interventions may not be known for years or decades. One option for addressing this challenge is to use extreme events (e.g., heat waves, king tides) and/or system stress indicators as proxies for long-term climate change (Hansen and Hoffman 2011). Another approach is to use a theory of change to inform the development and selection of adaptation options, indicators, and metrics. A theory of change lays out the expected relationships between the actions we take, the context in which we take them, and the outcomes we achieve over time (Figure 1). This allows for the measurement of progress along the way to the ultimate outcome (Figure 2). This approach is widely implemented in certain sectors that have well-established practices for M&E (e.g., international development).

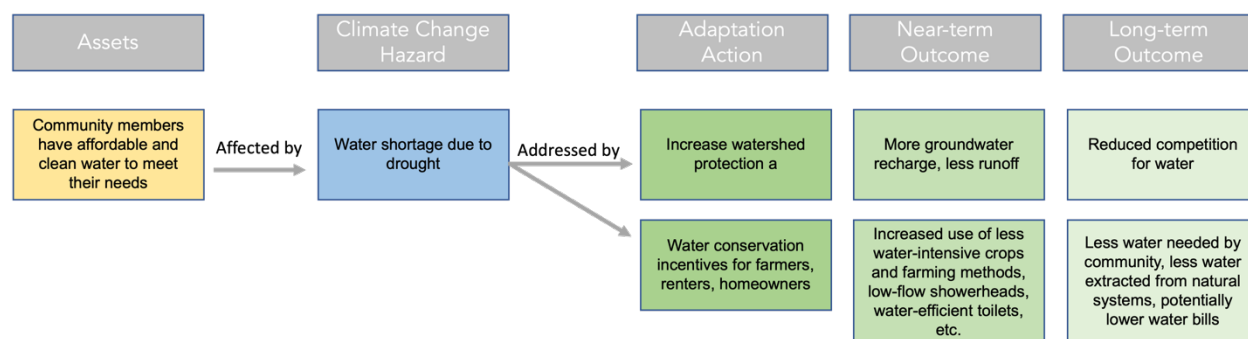


Figure 2. Results-chain applied to ecosystem-based adaptation (after Donati et al. 2020).

Another hurdle for bringing formal monitoring and evaluation (M&E) to bear on CCA is that definitions of success based on past conditions or ideal states may not be relevant or achievable as climate change, land use change, and other system drivers progress over time (National Park Service 2021). Adaptation M&E must grapple with developing indicators, metrics, and outcomes that can work with this deep level of uncertainty.

Finally, the implementation of CCA is so context-specific and value-laden that defining a common set of indicators or desired long-term outcomes is challenging and unlikely to reflect the reality of adaptation implementers. Efforts to develop a common set of indicators and metrics typically come from organizations or agencies who want to compare effectiveness, efficiency, or other outcomes across portfolios of adaptation projects carried out by multiple implementers (Spearman & McGray 2011, Michaelowa

and Stadelman 2018) rather than understanding and evaluating individual projects. For individual implementers, such “universal” indicators and metrics may or may not capture what matters or be feasible to monitor and analyze over time.

---

### Box 1: Terminology

Different entities define terms in different ways. Here is how we conceptualize indicators, metrics, monitoring, and evaluation in the context of this paper.

**Indicator:** The particular element of adaptation being assessed (Christiansen et al. 2018); a quality or trait that suggests (“indicates”) effectiveness, progress, or success (Arnott et al. 2016). One indicator may have multiple metrics in order to capture different dimensions of the indicator.

**Metric:** The specific unit of measurement (Christiansen et al. 2018); a variable that can be measured (if quantitative) or tracked (if qualitative) that represents the indicator (Arnott et al. 2016).

**Monitoring:** The systematic collection of information on specified indicators or metrics that provide information on the state of a system. It may occur before, during, and after project implementation and can be used to assess and inform the need for a program or project, the context in which planning and decision making will occur, ongoing implementation and accountability, program or project outputs, and triggering contingency plans.

**Evaluation:** The systematic investigation of the degree to which programs or projects achieved their goals and objectives, typically focusing on relationships between inputs, actions, and outcomes. Evaluation seeks to understand the why and how as well as the what. It may inform deeper learning around the form and focus of goals and objectives, for example whether a program’s goals accurately and adequately captured the full range of community voices and values. It may also test assumptions underlying adaptation actions and outcomes.

---

Despite these challenges, there is great value for the field of adaptation in being able to compare across interventions to learn about relative effectiveness, costs, equitability, unanticipated consequences, and so on. For organizations and government entities charged with ongoing planning, including adaptation, there is likewise value in learning

what works, what does not within their specific context in order to inform subsequent decision making and expenditures.

There are several pitfalls to watch out for, however (Leiter and Pringle 2018, Bours et al 2014a). These include:

- Focusing on the overall content of an indicator (e.g., number of properties at risk of flooding) but not on how it will be measured and calculated (e.g., FEMA flood maps, which omit many types of flood hazard, vs. approaches including the full suite of flood risks)
- Creating perverse incentives and maladaptation. Indicators that focus solely on near-term costs and benefits, for example, may incentivize less durable adaptation approaches or approaches that cause other harms.
- Providing a sense of progress when vulnerability is actually not being reduced. As noted by Pringle (2011), *we must ask whether we are doing the right things, not just whether we are doing things right.*
- Without some theory behind them, indicators provide no information on why things are the way they are, which limits the ability to learn from them.

## MODELS FOR EVALUATION THAT EXIST TO DATE

The purpose of this paper is not to provide systematic overview or typology of frameworks, indicators, and metrics for adaptation M&E; there have been many such efforts in recent years (e.g., the International Platform on Adaptation Metrics (IPAM) 2022, Dillard 2021, Bours et al. 2014a, Hammill et al. 2014, Clavin et al. 2020, Hale et al. 2021). Our focus is rather to provide some inspiration and best practices for the development, selection, and use of CCA indicators and metrics along with examples of how to apply them within specific planning processes, i.e., the Steps to Resilience and a typical comprehensive planning process.

Many guides and best practices toss around phrases like context-driven, theory of change-based, flexible, and adaptable—these are all really code for “you need to put in time and effort if you want an assessment framework that is useful and do-able for your project.” Many syntheses of adaptation M&E have concluded that assessment frameworks must choose between 1) being open and flexible, meaning they require significant fine tuning for different applications and are unlikely to provide

standardized, aggregable metrics, or 2) using standardized indicators that can be broadly applied and compared but by themselves are unlikely to provide context-specific information desired by many stakeholders (Christiansen and Martinez 2018). Although doing the work yourself is hard, a good process for developing indicators and metrics can be worth the effort. It can

- Establish community resilience goals that reflect the full suite of stakeholder values and interests
- Provide insights into how social, environmental, and built systems function and interact that will be essential to designing effective adaptation actions
- Ensure that adaptation plans are equitable and inclusive, reflecting the diversity of stakeholder groups affected by such plans. Who gets to define what matters is inherently political, and elicitation and development of indicators and metrics can be a path towards equitable community involvement.
- Provide credibility for the indicators and metrics used
- Focus monitoring and evaluation on what matters. “It is more helpful to have approximate answers to a few important questions than to have exact answers to many unimportant questions (Spearman and McGray 2011).”

A theory of change approach, as mentioned earlier, can help to develop indicators of intermediate progress on the way to long-term adaptation outcomes. As illustrated in Figure 3 it can support the development of indicators and metrics for other purposes as well, including monitoring for implementation and effectiveness; whether the necessary conditions exist to implement proposed adaptation actions; to see when contingency plans should be put into action; to assess the quality of the process underlying adaptation planning, implementation, and evaluation; and to test assumptions underlying the design, implementation, and predicted effects of adaptation action to enhance learning.

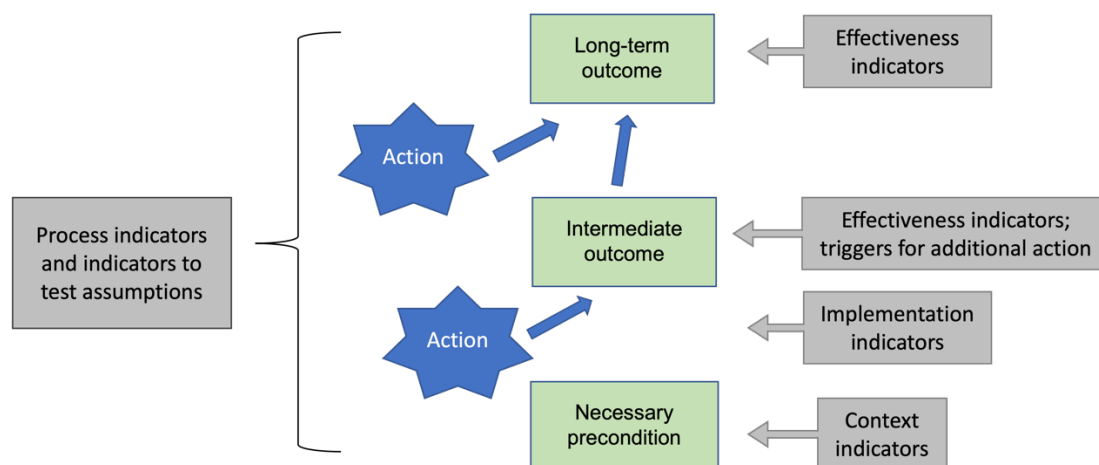


Figure 3. Indicators in the context of a theory of change

There are two other benefits of a theory of change approach that are particularly noteworthy when it comes to M&E. A theory of change can help to explain why an initiative did or did not work, and can help to create consensus on how success or failure will be documented (Bours et al. 2014b).

## TO MEASURE SUCCESS

The Resilience Metrics Toolkit (Moser et al. 2020, <https://resiliencemetrics.org/>) provides a suite of information, tools, and resources for identifying, selecting, and using indicators and metrics of resilience. Our aim here is not to replicate the how-to information that is already available, but to underline a few essential but often overlooked elements of identifying, choosing, and using indicators and metrics: clearly articulating who will use the information produced, how they will use it, and for what purposes; matching the process of indicator development to adaptation goals and values; considering the full range of indicator types and approaches; and matching the M&E approach to the context in which it will occur.

Who will use the information, how, and for what purposes?

The first step in developing and selecting adaptation indicators and metrics is to understand who will use the information, how, and for what purposes. This is a best practice for bridging the science-practice gap in general (Vogel 2007) as well as for M&E. Different groups (e.g., academics, boundary organizations, funders, and implementers) may have different motivations for developing and using I&M (Arnott et



al. 2016), and recent work has noted a disconnect between what is considered important in theory vs. in practice when it comes to adaptation indicators (Peterson St-Laurent et al. 2021). In adaptation planning and implementation, domains of M&E application include:

1. Context and planning
  - a. Assessing and evaluating any or all of the following:
    - i. Climate change (hazards)
    - ii. Variables influencing sensitivity (social, natural, economic, etc.)
    - iii. Variables influencing adaptive capacity (social, natural, economic, etc.)
    - iv. Barriers to adaptation
    - v. What enabling conditions are in place for desired interventions
    - vi. The state of adaptation in particular geographies, sectors, etc.
2. Communication, engagement, and capacity-building
  - a. Justifying investments
  - b. Fundraising
  - c. Community engagement and support
  - d. Communicating risks and successes
  - e. Building capacity of stakeholders to evaluate and plan for climate hazards
3. Decision making
  - a. Assessing and evaluating information quality; the need for different adaptation options; costs and benefits of different options and the distribution of those costs and benefits across space, time, and stakeholders; etc.
  - b. Prioritizing and directing limited funding
4. Implementation processes and accountability
  - a. Monitoring and evaluating
    - i. Integration of adaptation into planning processes
    - ii. Implementation of adaptation programs, projects, or actions
    - iii. Inclusion of DEI, NbS, etc. into adaptation plans, projects, etc.
5. Outcomes and effects
  - a. Evaluating
    - i. Results of actions, projects, programs or portfolios

- ii. Whether vulnerability has been reduced or resilience improved as a result of actions
  - iii. Progress towards adaptation goals, targets, outcomes
- b. Exploring options for transformative change

## When and how indicators, metrics, and the M&E plan are developed

For some outcomes, the process by which indicators, metrics, and the M&E plan are developed and carried can be critical. Efforts to build community-based adaptation, for example, could be undermined by a failure to use community-based M&E (CARE and IIED 2014). A program or project cannot be inclusive if the process for developing and carrying out M&E is not also inclusive. Determining the role of building local capacity in support of the implementation of adaptation actions is research underway (see Stern et al. 2020).

## Type and focus of indicators

Although much adaptation M&E to date has focused on quantitative indicators of action implementation (Leagnavar et al. 2015), this is just one option among many. Qualitative indicators can provide different types of information than quantitative ones, and assessing adaptation outcomes as well as implementation is essential for learning and adjustment over time.

Quantitative indicators reflect the notion of magnitude, i.e. they are inherently numerical. They can be discrete (e.g., number of households in a flood zone) or continuous (e.g., acres of land in a flood zone). In contrast, qualitative indicators are not inherently numerical. They are typically based on a narrative assessment and have varying degrees of structure or open-endedness. Quantitative indicators are often assumed to be more objective or accurate than qualitative indicators, but this is not the case. Qualitative indicators typically capture a depth of information that is absent from quantitative indicators. For example, the quantitative indicator “number of stakeholders attending adaptation workshops” says little about the quality of the workshops, whether stakeholders have put any of their learning to use, etc. Combining qualitative and quantitative indicators may support more meaningful evaluation.

---

## BOX 2: Examples of Quantitative & Qualitative Indicators to Measure Outcomes

- Number of educational materials produced and the extent of their use
- Number of training programs and their impact on improved disaster preparedness
- Number of training programs and long-term capacity development activities

SOURCE: Lamhauge, Lanzi, and Agrawala 2011

---

Beyond the choice of quantitative vs. qualitative indicators, it is important to recognize that indicators and metrics should be developed for different points along the adaptation results chain, not just the implementation stage. As described earlier, results chains represent explicit hypotheses and assumptions about how a selected intervention will achieve the desired long-term outcomes, laying out the steps along the path from inputs to activities to near- and long-term outcomes. Implementation indicators, which tend to be near-term and easily measured, are merely the first step in an anticipated pathway leading to higher-order, transformative changes. Having a clearly articulated theory of change facilitates development of indicators and metrics for these higher-order changes, which are longer-term and more difficult to measure.

### Enabling conditions for adaptation monitoring and evaluation

The appropriate number and complexity of indicators, metrics, and the monitoring and evaluation plan overall, like adaptation itself, depends on context. Even the most brilliant monitoring plan is of little use if the enabling conditions to implement it do not exist. This may in part explain why a recent review found little evidence for the use of CCA indicators in practice (Arnott et al. 2016). Some elements that influence what M&E is appropriate for a given effort include:

- 1) Funding. What staff time, technology, equipment, consultants, and other specialists can you currently afford? What funding is likely to be available for M&E in the future, and what can you do to increase the likelihood that necessary funding will be available?

- 2) Experience. How much experience do you have with well-executed M&E in other realms? Is the ambition of your adaptation M&E plan commensurate with the existing level of M&E in your group?
- 3) Buy in from relevant parties (inside and outside of government)
- 4) Parties to undertake evaluation. Is it clear who is responsible for M&E.
- 5) Process that can accept new information as collected from M&E.
- 6) Continuity of governance

#### HOW CAN SUCCESS BE MEASURED AT EACH OF THE STEPS TO RESILIENCE?

Using the concepts employed in many of the approaches described above (focus on Moser et al. 2020 and Reid et al. 2017), relevant goals, indicators, and metrics, often in the form of questions, have been created for each of the Steps to Resilience (StR) (Table 1). Additional approaches for measuring both process and outcomes success related to Nature-based Solutions (NbS), Diversity, Equity and Inclusion (DEI) and Adaptation Finance are also presented. For each Step, Table 1 presents the goal, indicators of success, and possible metrics or questions to identify metrics to use to measure the effectiveness of the work being done. To better translate this for end users, a version has been created that maps to the traditional elements of a community Comprehensive or General Plan, which are also conveniently representative of the range of activities being undertaken by most communities (Table 2).

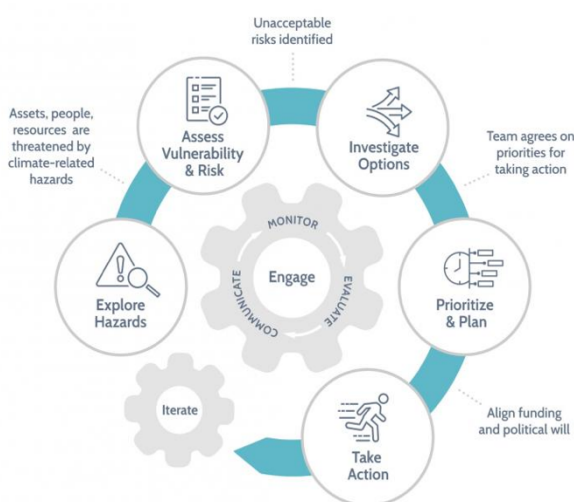


Figure 4. The Steps to Resilience

A brief description of measuring the success of undertaking the process of the StR (Figure 4) and of the subsequent adaptation actions that are developed and implemented is as follows:

## **Explore Hazards**

There are two aspects to this step: identification of community concerns and exploration of potential hazards relevant to those concerns. Both matter for the full StR process and it is comparatively easy to ensure they occur and are successful. The challenge at this step, since it is the beginning, is determining that sufficient scope is achieved, reflecting the knowledge and interests of those who can affect or will be affected by adaptation actions. A key consideration is whether the full range of stakeholders is included in identifying community concerns or assets of interest. If not, consider what other planning processes and partners might help to deepen engagement. At a minimum, be transparent about how community concerns were identified, perhaps using outcomes from past community planning efforts if no other engagement is possible. Similarly, confirm that all relevant climate hazards are being considered rather than limiting scope in a manner that will prevent a proper assessment of vulnerability and risk in the next step. This may require exploring multiple sources of information (climate projections, Traditional Ecological Knowledge, community knowledge, observational data).

Key questions for assessing this step:

- Is the full range of stakeholders and perspectives represented in identifying community concerns or assets?
- What will future conditions be like for your location over the full lifecycle of the community asset?

## **Assess Vulnerability and Risk**

This Step encompasses a process to evaluate the vulnerability of community assets and to characterize risks based on the probability of the hazard occurring and the magnitude of potential loss. Who gets to define what matters (i.e. what is at stake and the magnitude of potential loss) is an inherently value-laden process. There is no “objective” risk, and every effort should be made to plan and carry out an equitable and inclusive process that reflects diverse demographic, social, and cultural groups. This step should produce an explicit assessment of how identified hazards potentially impact community assets. It is essential to focus not just on the outputs of this step—vulnerability and risk

assessment reports and maps, for example—but also on building the capacity of participants and community members to conduct such assessments in the future.

Key questions and metrics for assessing this step:

- Will future climatic conditions adversely affect community assets—function, integrity, access, and cost—as *defined and valued by the affected communities*?
- Can the process be repeated by participants in subsequent iterations as challenges and insights emerge over time?
- Use climate hazard data (mapped or otherwise) to assess the impact these hazards will have on the community assets.

### **Investigate Options**

Identifying vulnerabilities and risks for community assets in Step 2 ideally leads to developing approaches to reduce or manage those risks in Step 3. When developing adaptation strategies, it can seem convenient to begin with actions already being implemented to solve other challenges. This can result, however, in failing to effectively address the climate risks identified in Step 2. The investigation of options should result in a diverse and creative list of potential strategies to reduce the risk to community assets from the full range of climate hazards identified.

Key questions and metrics for assessing this step:

- Do these strategies address all the identified climate hazards in a manner that encompasses community-defined risks as well as maintaining assets?
- Are actions linked to the vulnerabilities they are meant to address and the outcomes they are meant to achieve by a clear theory of change or results chain?

### **Prioritize and Plan**

It is unlikely that the full list of potential strategies could or even should be implemented; it is necessary to evaluate and select adaptation options using an explicit set of criteria. Criteria should be developed in a deliberative and inclusive process and reflect the full suite of stakeholder concerns and values as *articulated by stakeholders themselves*. While it may be tempting to lump some

concerns into a generic “co-benefits” criterion, this may imply that such concerns or values are less important or not worthy of full consideration. Criteria should also address feasibility (funding, expertise, and other enabling conditions) and the range of risks identified in Step 3. Having explicit, understandable, and easily available criteria allows stakeholders to see that their concerns were included in the prioritization process, makes tradeoffs transparent, and shows how “success” is being defined by decision-makers. Again, the enhancement of local capacity should be a goal to support the iterative nature of adaptation planning processes.

Key questions and metrics for assessing this step:

- Does the plan address the full range of hazards and vulnerabilities identified in previous steps?
- Double check that all risks and vulnerabilities are being addressed by the plan. Consider relative value, trade-offs, timeline, contingency plans, and decision points for the suite of risks, community values and potential solution pool.
- Are prioritization criteria easily available, understandable, and transparent?
- Consider repeating Step 2 for proposed adaptation actions to ensure that actions themselves are not vulnerable.
- Have you built the technical capacity of the participants through training, full engagement, or other means so resilience work can continue in perpetuity?

### **Take Action**

This may be the most interesting step when it comes to M&E. You must plan not just to assess whether actions took place as planned, but also whether they had the desired effect on identified vulnerabilities and risks, whether that led to the desired outcome for the community, and whether assumptions underlying adaptation strategies were correct. There may even be additional opportunities in this Step to test hypotheses about effectiveness by collecting baseline data (conditions before implementation) as well as identifying and monitoring control sites (similar locations where no action is implemented). This information can be a powerful element of adaption planning as it allows communities to determine

if modification may be needed or if adaptation actions should be expanded. Consider creating an M&E plan to codify a process of continued assessment of adaptation effectiveness over time. The M&E plan could be coupled with the communications plan suggested in the “Sharing” step.

Key questions and metrics for assessing this step:

- Have the actions been implemented?
- Have the vulnerabilities been reduced by the actions? Are you seeing reduced evidence of harmful climate impacts?
- Implement a monitoring plan to measure function of social, built, or natural systems in relation to supporting community assets.

## Sharing

In this Step, the process, actions, and outcomes should all be shared within and beyond the community. This will deepen understanding of what has taken place and its effects, as well as help others who may be earlier in the adaptation process to make better decisions. Consider communication with peers in other communities through professional societies, regional government working groups and online tools used for adaptation (e.g., Climate Adaptation Knowledge Exchange). This Step could include development of a [Climate Adaptation Communications Plan](#) that supports community monitoring and tracking of adaptation progress.

Key questions and metrics for assessing this step:

- Are stakeholders aware of the current and projected effects of climate change?
- Are they aware of the associated risks for community assets and how the implemented actions reduce that risk?
- Were stakeholders included in the process of identifying risks and solutions?
- Can stakeholders track progress toward meeting adaptation goals and the effectiveness of those actions?
- Survey for inclusion in sharing platforms.
- Interview local partners to gauge inclusion, awareness and sharing.
- Create an Adaptation Communication Plan that includes methods for community tracking of adaptation or risk reduction progress.



While the M&E recommendations discussed above and in the “general” column of Table 1 can apply to any topic of adaptation interest, there are always potential additions. For example, this M&E guidance was created in parallel with others addressing NbS, DEI, and Adaptation Finance; each of these could inspire additional indicators and metrics that may be useful to support successful outcomes.

### **Nature-based Solutions**

When employing NbS there are additional considerations for planning and therefore for M&E as well (Glick et al. 2020). For example, when “Measuring Hazards” it is important to consider hazards over the full geography required to support the ecosystem underlying the NbS; this may expand beyond the jurisdiction of the community. Good illustrations of this include cases exploring implications of climate change for surface water supply, flood plain function, and food security. Similar logic applies to the “Assess Vulnerability and Risk” step. To stimulate greater creativity when “Investigating Options,” consider whether NbS strategies could replace traditional grey infrastructure solutions, as well as identifying actions that might benefit natural systems as well as other community assets. This approach feeds into the “Prioritize and Plan” step in that actions that address multiple risks across multiple systems may have fewer trade-offs. In the “Take Action” step, include monitoring to assess whether natural systems are also benefiting from the actions implemented. This may require additional metrics specific to key species, habitats or ecosystem functions. When “Sharing” results from NbS inclusive process, outreach should include organizations and agencies focused on natural resource management and conservation.

### **Diversity, Equity & Inclusion**

As stated above, vulnerability and risk assessment and the development and selection of adaptation strategies are inherently value-laden processes; failure to include the full suite of relevant stakeholders will result in a process and outcomes that are biased and unnecessarily narrow. Undertaking the StR in a manner that explicitly engages the full diversity of the affected community and develops equitable solutions is essential for the long-term success of local adaptation. M&E can be used as a tool to ensure that DEI principles are being

employed by incorporating indicators addressing issues such as whether vulnerability and risk assessments and adaptation strategies have accounted for differences related to historic or current inequities, or whether costs and benefits of proposed strategies are shared in an equitable fashion. The *process* of M&E itself can be a tool for increasing DEI if the full range of stakeholders is fully engaged in the development of indicators and metrics as well as the monitoring and evaluation of those metrics. This broad engagement will also help in the “Sharing” step as those from different segments of the community help to share outcomes and generate input on next steps in ways best matched to their peers. In particular, if monitoring and evaluation indicate that actions and benefits are not being experienced equitably, there should be opportunity to provide input into how it can be improved.

### **Adaptation Finance**

Adaptation cannot happen without funds to support it. These funds may be the climate-savvy application of existing dollars, or they may be new sources owing to expenditures beyond the community budget or in new, previously unfunded areas of need. It is important to ensure that funds, which are often in short supply, are spent in an effective, equitable manner; hence an important role of M&E at each step of the StR is to provide this assessment. The potential risk of climate change to funding sources must also be considered. For example, if climate change is expected to harm the local economy or housing stock, this can decrease the tax base. Local funds can also be diminished if there is increasing demand for limited resources due to extreme climate conditions. Such changes can shift the balance sheet and make it necessary to find additional funds even when funding was considered secure. Based on unforeseen changes, it may also turn out that actual expenses to undertake resilience actions are more than projected making long-term implementation of actions that require consistent care unsustainable. As part of making adaptation more fiscally manageable or even part of annual community budgeting, it is important that M&E results be shared with governmental and non-governmental funders so the value and expectations of adaptation investments can be better understood. This may help increase the demand for adaptation actions associated with some level of efficacy testing.

## HOW CAN SUCCESS BE MEASURED ACROSS SITES?

While monitoring and evaluation at the project or site level can inform local success and learning, efforts to use monitoring and evaluation to build the field of adaptation will require more global approaches (Figure 5). This field level monitoring and evaluation can gather learning across sites, using common or unique adaptation approaches to learn:

- Are the Steps to Resilience being completed? If not, which Steps are most commonly completed? What are the barriers to completion?
- Does completion of an adaptation process, such as the Steps to Resilience, result in reduced risk or vulnerability from climate hazards?
- Is maladaptation occurring?
- Are other goals incorporated into the process (e.g., DEI, economy, environment)?

This is explored further in Appendix B.

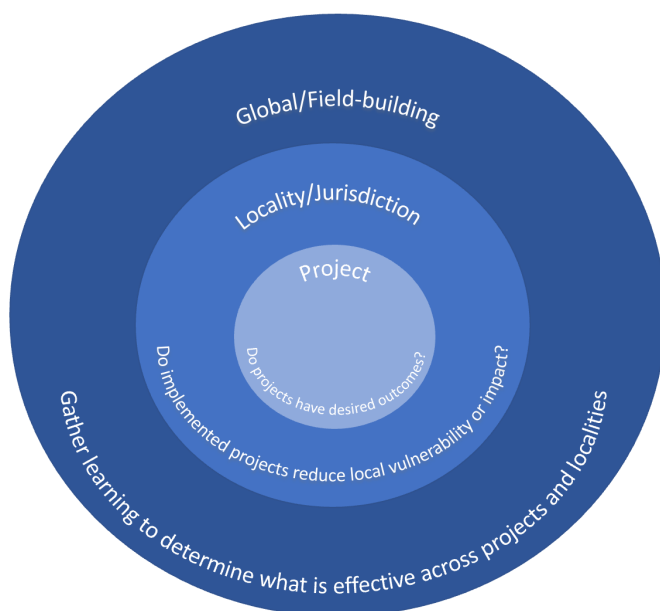


Figure 5. Levels of Monitoring and Evaluation

## PROPOSED PATH FORWARD

Here are four stepping stones to begin your M&E journey.

Stone 1: Mainstreaming. Embrace the value of mainstreaming M&E. Mainstreaming M&E is key to better decision making and community and natural system resilience. While it can seem like an added burden, it is not just extra unnecessary work to satisfy a supervisor or funder, rather it is a tool to ensure that time and effort are used to the greatest effect. In the associated training module, there are tools to directly support community efforts to incorporate M&E into an adaptation process and practice. See Box 3 for an example of mainstreaming.

Stone 2: Carry a Map. Leverage the process of M&E development and implementation to stimulate as well as measure engagement, capacity-building, and creative thinking. For example, the flowchart in Figure 6 can be used as a checklist-style evaluation for whether M&E best practices are being followed, with each yes/no question serving as an opportunity to stop and consider whether all important considerations for that step have been addressed. Each box and its associated tool(s) can also be used as a reminder to think more deeply about each step in the adaptation journey.

Stone 3: Chart a course. Maximize the likelihood of success AND rate of learning by explicitly articulating a theory of change or results chain, including testable assumptions. Without deliberate, systematic M&E, learning is haphazard at best. Failing to recognize let alone test assumptions, can lead to drawing misleading conclusions about why actions succeeded or failed. Having an explicit visual representation of what is trying to be achieved and how it is trying to be achieved allows stakeholders to see whether their values, concerns, and aspirations were captured. They can also indicate if participants have different understandings of how the system functions that might identify the need to re-evaluate what actions to take, or to take some actions to explicitly test different hypotheses about the state of the system or how it works. The questions presented by sectoral interests in Table 1 and 2 and the training module worksheets may be good starting points.

Stone 4: Don't journey alone. Scaffold for success by building local capacity to take on the next iterations of local resilience work. While initially there may be a desire to seek the support of outside "experts" to develop, implement, and evaluate adaptation actions, both the process and outputs of M&E can build confidence and ability of a

community to “do adaptation” and do it well. Including M&E in external and internal communications, as in the Climate Adaptation Communication Plan in Appendix A, is an opportunity to celebrate successes while also reinforcing a commitment to continued learning.

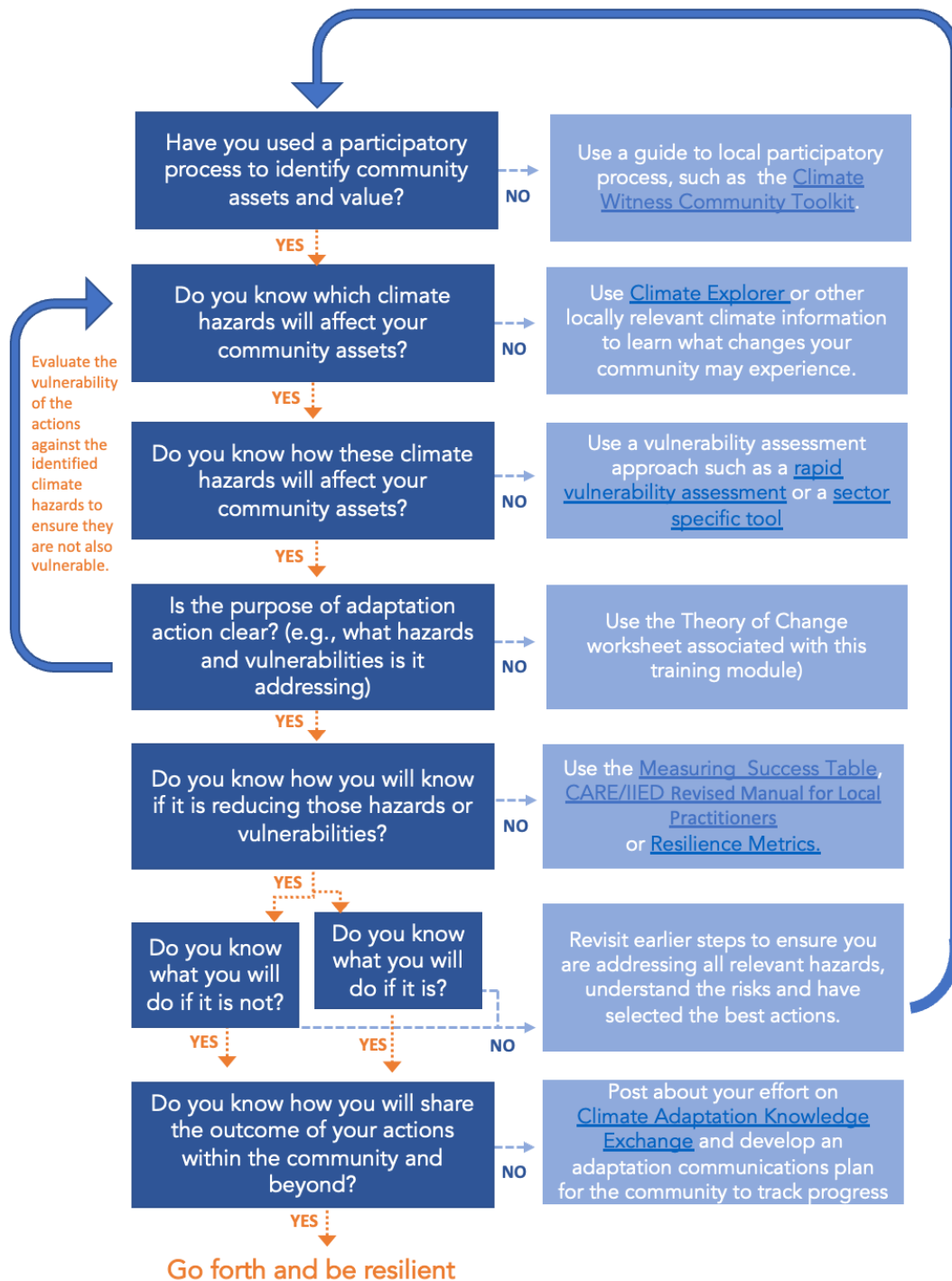


Figure 6. Flowchart for use by adaptation practitioners to incorporate M&E into an StR process

---

### BOX 3: Example of M&E for adaptation efficacy in Housing

Sample project: Address overall housing shortage, with particular attention to affordability.

1. **Explore Hazards:** Identifying housing relevant hazards starts by determining the range of potential hazards to be experienced in the location where housing will be sited, then considering which hazards might be relevant to the structure and habitability, as well as the origin and transport of the materials needed to construct the housing. What indicators and metrics will capture this suite of hazard-related information in ways that support communication, deliberation, and evaluation?
2. **Assess Vulnerability & Risk:** Housing is vulnerable not just due to where it is located but also how it is built and where it is in relation to the other features that make housing suitable (e.g., jobs, schools, grocery stores, medical care, transportation). In evaluating the vulnerability of housing, you must consider the structure (design and materials), its location (siting in relation to services as well as hazards), access to it, and how costs may change over time with a changing climate. What indicators and metrics will capture this suite of vulnerabilities and risks in ways that support development and evaluation of adaptation options?
3. **Investigate Options:** Your best adaptation strategy is only as good as what's included in your list of options. Use output from previous steps to develop a range of options to address each risk and vulnerability. What indicators and metrics will support informed evaluation and selection of adaptation actions in the next step?
4. **Plan & Prioritize:** Best practices for evaluating and selecting actions involve clear criteria that match community values. These criteria (indicator and metrics) support a deliberative approach to deciding which risks to manage at what cost and which to accept.
5. **Take Action:** After implementing the new housing plan, it will be necessary to determine if:
  - Housing has been built, rehabilitated, or otherwise made newly available. How much and by when? What types on the affordability and size spectrum? These data are available through local permitting offices (building, rental certification).
  - New housing stock meets the community's needs. This can be assessed through community data about housing security and surveys of residents, as well as of the local workforce who may be commuting due to lack of local, appropriate housing stock.

- The community's housing stock is affordable. Affordability needs to be measured not only by rent or sale prices, but also through costs related to heating and cooling, maintenance, transportation to work, education, and goods and services. This can be done through local cost index data, review of utility bills by neighborhood or housing unit, and conversation with local community members.
  - The community's housing stock is livable under altered climatic conditions. This can be assessed by monitoring interior temperatures, housing damage reports and requests for repair permits, occupancy rates, or public health records. Community surveys on livability could also be conducted, which could include questions such as how many days require heating or cooling, and how many days could heating or cooling not meet demand.
6. **Share:** Creating a transparent process toward development and implementation of adaptation strategies can only be achieved if a co-production approach is applied from identifying community assets and hazards through implementation and monitoring. For housing this will require the involvement of residents, neighbors, employers, transit planners, service providers, financiers, developers, and probably others. Their continued engagement will be important as ongoing monitoring triggers contingency plans or identifies the need for further decisions about whether to modify housing (or associated) plans or to continue on the same path. In all cases information gathered should be shared with peer communities to help them learn from the efforts of those that have come before them.
-

TABLE 1: Measuring Success by Step to Resilience

		General	Nature-based Solutions	Finance	Diversity, Equity, Inclusion
<b>Measuring Hazards</b>	Goal of M&E for this step	Relevant community assets and climate hazards are identified by the community.			
Goal: Identify community concerns and explore potential hazards to those concerns	Indicators for success at this step	Community is engaged in identification of valued assets. Climate data (across the full array of potential hazards, including sources such as TEK and community knowledge) is accessed. Both direct (e.g., increasing rainfall) and indirect (e.g., increasing runoff because of increasing intensity and frequency of wildfires) climate hazards should be considered.	Identify hazards across the full geography required to support the ecosystem providing the NbS. May be significantly larger than the jurisdiction of the target community. Engagement of other jurisdictions may be required to identify the full range of relevant hazards from external perspectives.	Identify how community concerns/assets and hazards may affect or be affected by financial mechanisms	Identify hazards and community assets through a process that involves co-creation, collaboration across sectors, historical/current/future context.
	Sample metrics (or questions to identify or assess metrics) of effectiveness of this step	Is the full range of stakeholder perspectives represented in identifying community concerns or assets? What will future conditions look like for your location during the full lifecycle of the community asset? Map climate hazard data for community assets.			
<b>Assess Vulnerability &amp; Risk</b>	Goal of M&E for this step	Effects of relevant climate hazards on community assets are understood			
Goal: Understand vulnerability of	Indicator for success at this step	Explicit assessment of how hazards potentially impact community assets			



community assets by assessing their sensitivity and adaptive capacity, then characterize risk based on probability of the hazard and the magnitude of potential loss.	Sample metrics (or questions to identify or assess metrics) of effectiveness of this step	Will future climatic conditions adversely affect community assets--function, access, cost? Can the process be repeated by participants for subsequent iterations of this process either due to later learning or emerging challenges? Use climate hazard data (mapped or otherwise) to assess the impact these hazards will have on the community assets.	Will alternations in natural systems either adversely affect or provide an opportunity to support community assets?	Will existing funding be affected by climate change, such as being overwhelmed by an increase in demand? Will new funding streams be necessary? Is that possible?	Is the variable sensitivity of communities being considered given historic inequities? Have additional significant stressors that can interact with climate change been included?
<b>Investigate Option</b>	Goal of M&E for this step	Strategies address vulnerabilities and risks			
Goal: Develop strategies that could reduce the identified risks, determine which strategies are most viable	Indicator for success at this step	List of potential strategies that will reduce the risk to community assets from the full range of climate hazards identified is created.			
	Sample metrics (or questions to identify or assess metrics) of effectiveness for this step	Do these strategies address all of the identified climate hazards in a manner that will maintain community assets? Directly link actions to the vulnerabilities they are meant to address.	Are there strategies that employ NbS to augment or replace grey infrastructure? Are there strategies to benefit both community assets and natural systems?	If new funding is necessary, what other funding streams could cover adaptation actions?	Are there strategies that correct historic inequities while addressing climate risk?
<b>Prioritize &amp; Plan</b>	Goal of M&E for this step	Confirm that strategies have been methodically evaluated, identifying best bets, and that a plan has been developed			
Goal: Evaluate costs, benefits, and staff capacity to implement the	Indicator for success at this step	1. Evaluation criteria selected and evaluation process documented 2. Development of a plan of actions for implementation 3. Employee a process that includes all appropriate parties	Do strategies multi-solve (support more than one community asset, include natural and build systems)?	Is funding an inherent part of strategy design?	Do strategies multi-solve (support more than one community asset, and explicitly include DEI)?

preferred strategies, then create a plan based on the highest value actions		<p>Does the plan address the full range of hazards and vulnerabilities identified in the previous steps?</p> <p>Double check that all vulnerabilities are being addressed by the actions in the plan. Consider relative value, trade-offs, timeline, and decision points for the suite of risks, community values and potential solution pool. Are there easily available, understandable, and transparent criteria?</p> <p>Has sufficient training been incorporated such that participants can repeat this process successfully?</p> <p>Consider repeating Step 2 to ensure plan actions are not also vulnerable.</p> <p>Have you built the technical capacity of the participants in this process so resilience work can continue in perpetuity?</p>			
	Sample metrics (or questions to identify or assess metrics) of effectiveness of this step		Is the vulnerability or risk addressed by implementing an NbS that is also beneficial to natural systems?	Which actions can be covered by existing funding, which ones will need new funding?	Do strategies support all community members? Do any support some while adversely affecting others?
<b>Take Action</b>	Goal of M&E for this step	Adaptation action is taken, and its effectiveness is assessed.			
Goal: Secure funds and implement your plan, including monitoring effectiveness and adjusting actions as indicated	Indicator for success at this step	1. Adaptation action(s) implemented. 2. Baseline conditions were measured and perhaps a control site identified. 3. Monitoring plan and practice is put into effect. 4. Monitoring data are collected and analyzed to determine if actions are effective. 5. If necessary, modifications are made.			
	Sample metrics (or questions to identify or assess metrics) of	<p>Has the action been implemented?</p> <p>Has the vulnerability been reduced by the action? Are you seeing reduced evidence of projected impacts?</p>	Are natural systems benefiting from the action?	Are actual expenses different from projected expenses? Will implementation be	Are any groups being adversely affected by the action or its implementation? Are any

	effectiveness of this step	Implement a monitoring plan to measure function of social, built, or natural systems in relation to supporting community assets.		sustainable?	groups not benefiting from the action?
<b>Sharing</b>	Goal of M&E for this step	Process, actions, and outcomes are shared.			
Goal: Document your process and share it broadly	Indicator for success at this step	Internally and externally the risk, your actions and their effectiveness are understood.			
	Sample metrics (or questions to identify or assess metrics) of effectiveness of this step	<p>Are stakeholders aware of the current and projected effects of climate change? Are they aware of the associated risk for community assets and how the implemented actions reduce that risk? Were stakeholders included in the process of identifying risks and solutions? Can stakeholders track progress toward meeting adaptation goals and the effectiveness of those actions?</p> <p>Survey for inclusion in sharing platforms. Interview local partners to gauge inclusion, awareness and sharing. Create a Climate Adaptation Communication Plan that includes methods for community tracking of adaptation or risk reduction progress.</p>	Results should be shared with other communities as well as natural resource management agencies.	Results should be shared with current and potential funders (governmental and non-governmental) so they better understand which investments are more beneficial and have the highest community return.	Ensure that all community members have access to outcomes and ability to provide input on next steps. Special attention should be paid to presenting how benefits of the actions are or are not benefiting or affecting the entire community. If results of monitoring indicate that actions and benefits are not being experienced equitably, there should be opportunity to provide input into how it can be improved.

TABLE 2a: Measuring StR Success by Comprehensive Plan Element

## Part 1: Capital facilities, Utilities, Transportation, Environment, Recreation, Water, Housing

Element	Capital facilities	Utilities	Transportation	Environment	Recreation	Water	Housing
Element Goal	Provide durable public facilities and services	Provide access, affordability, and consistency of utility services	Ensure safe, efficient, reliable transit options, including roads, public transit, and non-motorized transit options	Protect the natural environment in and around the community to support wildlife and ecosystem services, with additional benefit for public health	Meet community needs for recreational opportunities, including parks, open space, and other recreational facilities	Provide protection of the quality and quantity of water (ground and surface) for public water supply	Provide for preservation, improvement, and development of housing, making provisions for the needs of all economic segments of the community
Measuring Hazards	What climate hazards may affect community capital facilities?	What climate hazards may affect community utilities?	What climate hazards may affect community transportation (SOV, mass transit, non-motorized transit)?	What climate hazards may affect community or community-required environmental assets?	What climate hazards may affect community recreation?	What climate hazards may affect community water resources (drinking water, wastewater, receiving water)?	What climate hazards may affect community housing?
Assess Vulnerability & Risk	Will your facility be accessible and functional under future climatic conditions?	Will future climatic conditions prevent or hinder the function or delivery of utilities for your location? If so, how?	Will future climatic conditions prevent or hinder transportation service, infrastructure or use for your location? If so, how?	Will the environment (as measured by species, habitat, or services) be affected by future climatic conditions? Will this result in regulatory non-compliance or damage to natural or social systems?	Will future climatic conditions prevent or hinder recreational opportunities (timing, location, access)?	Will water quantity or quality change under future climatic conditions (both annual and seasonal)? Will demand, cost or efficiency of use change?	How will climate hazards affect available housing stock? How will climate hazards affect availability of housing (including cost of heating, cooling, water, transportation)?

Investigate Option	How could facility siting, design, maintenance, or use be adjusted to make capital facilities less vulnerable? Can criteria be created to better site and design capital facilities?	How could utilities be made less vulnerable to these impacts?	How could transportation be made less vulnerable to these impacts?	Are there strategies to benefit both community assets and natural systems? Are there unique strategies that will be required to support environmental protection?	What form will recreation take under future conditions? Will the mix of indoor and outdoor activities shift? What will this mean for energy costs and land use? Can recreation be co-sited with NbS?	How could access, affordability and quality be maintained under future conditions? Will timing of need change for any major users? Can NbS be part of the solution set such that Environmental benefits are also achieved?	How can you ensure there is available and affordable housing stock over the lifetime of existing and proposed housing stock?
Prioritize & Plan	Do prioritization criteria represent the full suite of stakeholder concerns and values? Are criteria understandable, explicit, and easily available?						
Take Action	Are capital facilities able to function and be accessed? Will they continue to be? Do extreme events, that are indicative of future climatic conditions, impede access or function?	Are utilities services more reliable? still affordable? accessible by all? Will they continue to be as conditions continue to change?	Is transportation more reliable? Have maintenance costs and access been steady? Have there been concomitant advantages such as emissions reductions?	Is the local environment less vulnerable to the changing climate (e.g., less plant mortality or stress, functional hydrology, less disease or pests, key species still present)? Are ecosystem services expected to remain functional?	Are recreation opportunities still accessible by all community members across all times of the year?	Is high quality water available throughout the year for all community members and target needs?	Is sufficient housing and sufficient affordable housing available for all community members (including costs for maintenance, utilities, and transport)?

Sharing	<p>Do contractors understand why capital facilities design and construction are being modified?</p> <p>Are community members informed for the reduced vulnerability or needed action?</p> <p>Are utilities, transport and other sectors collaborating to “multisolve” climate challenges and avoid mal-adaptations?</p>	<p>Do utility customers understand what is being done and why? Are you communicating with peer utilities to share lessons? Are you collaborating with other community assets to develop multi-solving actions and avoid maladaptation?</p>	<p>Are travelers informed about the effectiveness of the actions that have been made to increase resilience?</p> <p>Are contractors and transport service providers learning from these actions?</p> <p>Are transportation action outcomes shared with other community sectors that rely on or intersect with transit planning or service?</p>	<p>Are environmental actions communicated more broadly? Are concerns shared with the community, as well as actions residents can take to improve outcomes (e.g., water conservation, no idling, decreased use of harmful chemicals, soil protection, fewer impermeable surfaces)?</p>	<p>Do recreational users know what is being done to ensure continued access to recreational opportunities in a changing climate? Do they know what role they can play in improving outcomes?</p>	<p>Do all water users and those impacting water access, quality, and quantity aware of the current condition of water in your community? Can they track changes in these features over time to understand efforts to ensure continued service and protection in a changing climate?</p>	<p>Do residents and providers of housing understand how a changing climate will affect housing stock, access, and affordability? Are all groups included in housing solution development? How are local code or zoning changes communicated? Are outcomes being shared with other communities?</p>
---------	---	--	--	---	--	---	--

TABLE 2b. Measuring StR Success by Comprehensive Plan Element

## Part 2: Education, Health/Human Services, Agriculture/Food Security, Economic Development, Cultural Resources, Land Use

Element	Education	Health/ Human Services	Agriculture/ Food Security	Economic development	Cultural resources	Land Use
Element Goal	<i>Provide formal and informal educational opportunities, including schools, training, and outreach</i>	<i>Meet community needs for access to personal and public health care (physical and mental), and associated social services</i>	<i>Ensure access to affordable food by all community members, and where appropriate support protection of agricultural lands and cultivation</i>	<i>Support the development and maintenance of local economic activity</i>	<i>Protect and provide culture resources that reflect all segments of the community</i>	<i>Plan for and manage land within the community's jurisdiction to support the activities in all other elements</i>
Measuring Hazards	What climate hazards may affect community education?	What climate hazards may affect community member health and need for social services? Consider hazards that directly affect health as well as access to and provision of health care (including cost, transportation)	What climate hazards may affect local agriculture and community food security? Consider both local hazards and hazards that will affect regions tied to the community's food supply (e.g., supply chain, pollinators, water, transportation).	What climate hazards may affect community economic development? Consider both local hazards and hazards that will affect regions tied to the community's economy (e.g., supply chain, natural resources, transportation).	What climate hazards may affect community cultural resources (past and present)?	What climate hazards may affect local land use?
Assess Vulnerability & Risk	How will climate hazards affect educational opportunities (including school facilities, transportation, curriculum, costs) for community members? Do community	How will climate hazards affect the health of community members and their need for social services? Will they be able to access services due to changes to transportation, cost, availability?	How will climate hazards affect access to food and cultivation of local land? Will needs, transportation, or distribution sites change or need to change? Will agricultural output be affected by climate hazards or will climate change affect	How will climate hazards affect the existing economy? Will other opportunities emerge? Are impacts to connected economies from climate hazards likely to have effects in your local economy?	How will climate hazards affect cultural resources or access to them?	Will future climatic conditions prevent or hinder land use goals for your location? Are there particular land uses that are likely to be impacted more by climate change?

	members need additional educational opportunities or content given climate change?		costs?			
Investigate Option	How can community educational opportunities be ensured and maintain relevance given a changing climate?	How can the health impacts of climate change be reduced? How can access to health care and social services be maintained under changing climatic conditions with the added obstacles that emerge?	What can be done locally to ensure access to and production of food under a changing climate?	How could a resilient local economy be designed to adjust to a changing climate and still deliver jobs, services and products required by your community under changing climatic conditions?	How could access, preservation, and generation of culture resources be maintained in a changing climate?	What planning considerations could be made to reduce those vulnerabilities?
Prioritize & Plan	Do prioritization criteria represent the full suite of stakeholder concerns and values? Are criteria understandable, explicit, and easily available?					
Take Action	Are schools accessible, affordable, and habitable for all community members who require them? Is curriculum aligned with a changing world (e.g., studies include reflection of the realities of climate change)?	Do all community members have access to high quality, affordable health care? Are there impacts to local community member health in relation to climate hazards and risks? Is life expectancy or morbidity changing? Are there any emerging or fading illnesses?	Do all community members continue to or newly have access to affordable, healthy food throughout the year? Is agriculture continuing to or newly producing food for the local community and beyond? Are systems changing in such a way that other crops or food delivery options are emerging? Are rates of food waste changing?	Do all community members have access to living wage job opportunities? Are there emerging economic opportunities in relation to climate change (measured by new or growing sectors) or diminishing sectors (measured by shrinking sectors)?	Are existing cultural resources being preserved and access to them ensured? Are new cultural resources developing? Are cultural resources accessible to and developable by all community members?	Is the available land able to support the needs of the community including all other columns in this table? Are there any hazards that are undermining this which still need to be addressed?



Sharing	Are community educational opportunities available, accessible, and appropriate? Are all ages part of education adaptation solutions and monitoring?	Are community members aware of the health hazards associated with climate change? Do community members know how to avoid these hazards themselves or the actions being taken to help reduce their risk in the community? Are community members using available healthcare? Are local health care facilities providing climate hazard related care?	Do community members know how food access and agriculture are being affected by climate change? Do community members know what actions have been taken to improve food access and agriculture? Is there information sharing along the food supply chain (providers, consumers) from and to the community to ensure holistic solutions?	Do community members know how the local economy will be affected by climate change? Is the community in conversation with adjacent or connected economies to discuss mutually beneficial climate actions and their effectiveness?	Do community members understand the risk to cultural resources from climate change? Is there an understanding of how cultural resources may be shaped by climate change?	Do land users in the community understand how the impacts of climate change will affect them and their neighbors? Is there peer sharing with planners in neighboring or similar jurisdictions?
---------	---	--	--	---	--	--

## LITERATURE CITED

- Anderson, A.A. 2005. *The community builder's approach to Theory of Change*. The Aspen Institute.
- Arnott, J.C., S.C. Moser, and K.A. Goodrich. 2016. Evaluation that counts: A review of climate change adaptation indicators & metrics using lessons from effective evaluation and science-practice interaction. *Environmental Science & Policy* 66:383-392. [http://susannemoser.com/documents/ArnottMoserGoodrich--EvaluationThatCounts--revised\\_prepub.pdf](http://susannemoser.com/documents/ArnottMoserGoodrich--EvaluationThatCounts--revised_prepub.pdf)
- Bours, D., C. McGinn, and P. Pringle. 2014a. *Monitoring & evaluation for climate change adaptation and resilience: A synthesis of tools, frameworks and approaches*. 2nd edition. SEA Change CoP, Phnom Penh and UKCIP, Oxford.
- Bours, D., McGinn, C., & Pringle, P. 2014b. Guidance note 3: Theory of change approach to climate adaptation planning. Phnom Penh, Cambodia: SEA Change CoP, and Oxford, United Kingdom: UKCIP. Retrieved from <http://www.ukcip.org.uk/wordpress/wp-content/PDFs/MandE-Guidance-Note3.pdf>
- CARE and IIED. 2014. *Participatory monitoring, evaluation, reflection & learning for community-based adaptation: Revised Manual for Local Practitioners*. CARE International.
- Christiansen, L. and G. Martinez. 2018. Adaptation metrics: perspectives on measuring, aggregating and comparing adaptation results. In: Christiansen, L., G. Martinez, and P. Naswa. (eds.) *Adaptation metrics: perspectives on measuring, aggregating and comparing adaptation results*. UNEP DTU Partnership, Copenhagen
- Clavin, C., A. Dabreau, and E. Walpole. 2020. *Resilience, Adaptation, and Sustainability Plan Assessment Methodology: An Annotated Bibliography*. Technical Note (NIST TN), National Institute of Standards and Technology, Gaithersburg, MD. <https://doi.org/10.6028/NIST.TN.2117>
- Dillard, M. 2021. *Inventory of Community Resilience Indicators & Assessment Frameworks*. National Institute of Standards and Technology, Gaithersburg, MD <https://doi.org/10.18434/mds2-2297> (Accessed 2022-01-24)
- Gertler, P., S. Martinez, P. Premand., L. Rawlings, and M.J. Vermeersch. 2010. *Impact Evaluation in Practice*. World Bank, Washington, DC

- Glick, P., E. Powell, S. Schlesinger, J. Ritter, B.A. Stein, and A. Fuller. 2020. *The Protective Value of Nature*. National Wildlife Federation. Washington DC, USA.  
<https://www.nwf.org/protective-value-of-nature>
- Hale, T.N., S. Chan, A. Hsu, A. Clapper, C. Elliott, P. Faria, T. Kuramochi, S. McDaniel, M. Morgado, M. Roelfsema, M. Santaella, N. Singh, I. Tout, C. Weber, A. Weinfurter and O. Widerberg. 2021. Sub- and non-state climate action: a framework to assess progress, implementation and impact. *Climate Policy* 21(3):406-420. DOI: 10.1080/14693062.2020.1828796
- Hammill, A., J. Dekens, T. Leiter, J. Olivier, L. Klockemann, E. Stock and A. Glaser. 2014. *Repository of adaptation indicators. Real case examples from national monitoring and evaluation systems*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Eschborn, Germany.
- Hansen, L.J. and J.R. Hoffman. 2011. *Climate Savvy: Adapting Conservation and Resource Management to a Changing World*. Island Press, Washington DC
- IPAM. 2021. *AMME Framework: Adaptation Metrics Mapping Evaluation*. V 1.1. International Platform on Adaptation Metrics (IPAM), Rabat, Morocco.
- Lamhauge, N., E. Lanzi, and S. Agrawala. 2012. *Monitoring and Evaluation for Adaptation: Lessons from Development Co-operation Agencies*. OECD Environment Working Papers. 10.1787/5kg20mj6c2bw-en.
- Leagnavar, P., Bours, D., and C. McGinn. 2015. *Good Practice Study on Principles for Indicator Development, Selection, and Use in Climate Change Adaptation Monitoring and Evaluation*. Climate-Eval Community of Practice and the Global Environment Facility's Independent Evaluation Office, Washington, DC
- Leiter, T. and P. Pringle. 2018. Pitfalls and potential of measuring climate change adaptation through adaptation metrics. In: Christiansen, L., Martinez, G. and P. Naswa (Eds.) *Adaptation metrics: perspectives on measuring, aggregating and comparing adaptation results*. UNEP DTU Partnership, Copenhagen
- McFadzien, D., F. Areki, T. Biuvakadua and M. Fiu. 2008. *Climate Witness Community Toolkit*. WWF South Pacific Programme. <https://www.cakex.org/tools/climate-witness-community-toolkit>
- Michaelowa, A. and M. Stadelman. 2018. Development of Universal Metrics for Adaptation Effectiveness. In: Christiansen, L., Martinez, G. and Naswa, P. (eds.) *Adaptation Metrics: Perspectives on Measuring, Aggregating and Comparing Adaptation Results*. UNEP DTU Partnership, Copenhagen

- Moser, S.C. 2019. Not for the faint of heart: Tasks of Climate Change Communication in the Context of Societal Transformation. In: *Climate and Culture: Multidisciplinary Perspectives of Knowing, Being and Doing in a Climate Change World*, G. Feola, H. Geoghegan, and A. Arnall (eds.), pp.141-167. Cambridge University Press Cambridge, UK
- Moser, S., D. Boudreau, K. Goodrich, A. Cox, S. Bentz, L. Auermuller, and J. Arnott. 2020. *Resilience Metrics Toolkit*. National Oceanic and Atmospheric Administration. <https://resiliencemetrics.org/indicators-metrics/using>
- National Park Service. 2021. *Planning for a Changing Climate: Climate-Smart Planning and Management in the National Park Service*. NPS Climate Change Response Program, Fort Collins, CO
- Pringle, P. 2011. *AdaptME Toolkit: Adaptation Monitoring and Evaluation*. UK Climate Impacts Programme. <https://www.ukcip.org.uk/wp-content/PDFs/UKCIP-AdaptME.pdf>
- Singh, C., S. Iyer, M.G. New, R. Few, B. Kuchimanchi, A.C. Segnon, and D. Morchain. 2021. Interrogating 'effectiveness' in climate change adaptation: 11 guiding principles for adaptation research and practice. *Climate and Development DOI*: 10.1080/17565529.2021.1964937
- Spearman, M. and H. McGray. 2011. *Making Adaptation Count: Concepts and Options for Monitoring and Evaluation of Climate Change Adaptation*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Eschborn, Germany
- Stern, M.J., J. Brousseau, C. O'Brien, K. Hurst and L.J. Hansen. 2020. *Climate adaptation workshop Delphi study report: Facilitators' viewpoints on best practices*. Virginia Tech and EcoAdapt. [https://frec.vt.edu/content/dam/frec\\_vt\\_edu/documents/ClimateAdaptationVTandEcoAdaptJuly2020.pdf](https://frec.vt.edu/content/dam/frec_vt_edu/documents/ClimateAdaptationVTandEcoAdaptJuly2020.pdf)
- Reid H, N. Seddon, E. Barrow, C. Hicks, X. Hou-Jones, V. Kapos, A.R. Rizvi, D. Roe, and S. Wicander. 2017. *Ecosystem-based adaptation: question-based guidance for assessing effectiveness*. IIED, London. <https://pubs.iied.org/sites/default/files/pdfs/migrate/17606IIED.pdf>
- Spearman M., and H. McGray. 2011. *Making Adaptation Count: Concepts and Options for Monitoring and Evaluation of Climate Change Adaptation*. Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and World Resources Institute.

Vogel, C., S.C. Moser, R.E. Kasperson, and G.D. Dabelko. 2007. Linking vulnerability, adaptation, and resilience science to practice: Pathways, players, and partnerships. *Global Environmental Change* 17:349-364.

## APPENDIX A. Climate Adaptation M&E Communications Plan

An essential element of successful adaptation and of measuring that success is to have a means by which the effort is understood by all interested parties not only in the development and implementation of the adaptation strategies, but also in relation to how well the process and actions are working to reduce community risk. To that end, communication with interested parties needs to be undertaken in a manner that shares metric outcomes in as close to real time as possible, so they can also be part of any decision adjustments that are necessary. Additionally it has been noted (Moser 2019) that communicating about the results of measuring adaptation success can provide a sense of optimism around climate challenges. This section offers guidance and a template for a Climate Adaptation Communications Plan.

### **Audience**

Who needs to be a part of your adaptation planning, implementation, and monitoring process? The more inclusive this group is, the more likely you are to develop an adaptation plan that is more broadly effective and better received, ideally also addressing more than a single hazard, and reducing multiple risks across the community. Consider including and committing to communicate with departments across local government, adjacent jurisdictions, local interest and community groups, businesses, educational institutions, and other stakeholders in community success.

### **Message**

What information do the people who are essential to the success of the process need to be informed and active participants? This is not limited to the first steps of the resilience process wherein you identify the challenges and solutions but must continue through the implementation and monitoring so that decisions can be made going forward as new challenges arise or efforts need to be modified.

### **Sharing metrics monitoring and evaluation results**

What information do you need to share and when do you need to share it? Monitoring results are some of the most important information to share with process participants. They are the outcome of the effort and can be cause for celebration or a reminder that additional work is needed. This information should be shared regularly (as it is collected at a pre-determined time), with ready access (through an online portal or newsletter type communications) and in an easy-to-understand manner (such as through graphic representation against targets).

### **Engaging**

A communications plan should not be viewed as a dissemination plan at only the beginning or end of an adaptation process. Rather it should be a way to understand the questions and interests of the community, share the relevant information you have to address those questions and interests, and foster dialogue to explore ideas for subsequent iterations of action.

## Sample Plan Template for External Communication inclusive of M&E

\_\_\_\_\_ is undertaking a climate change adaptation planning process  
*community name*  
 with \_\_\_\_\_.  
*participating entities (local and neighboring government agencies, community groups, academia, business)*

Adaptation actions are designed to ensure the persistence or success of \_\_\_\_\_.  
*focal community assets*

The primary climate hazards identified through review of information resources and a community engagement process (\_\_\_\_\_) are \_\_\_\_\_.  
*date or link to event* *primary climate hazards*

Key vulnerabilities of concern were \_\_\_\_\_.  
*identified vulnerabilities*

An adaptation plan was developed with the following actions and metrics to assess their effectiveness (\_\_\_\_):  
*Insert link or citation for full plan*

<u>Action</u>	<u>Metric (what, how and by whom will it be measured)</u>
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____

Metrics can be monitored by local government staff, partners, consultants, or community members. In all cases, results will be shared on a \_\_\_\_\_ basis through  
*Timeline (monthly, quarterly, annually)*

local outlets including \_\_\_\_\_.  
*Websites, newsletters, other communications outlets used by the community*

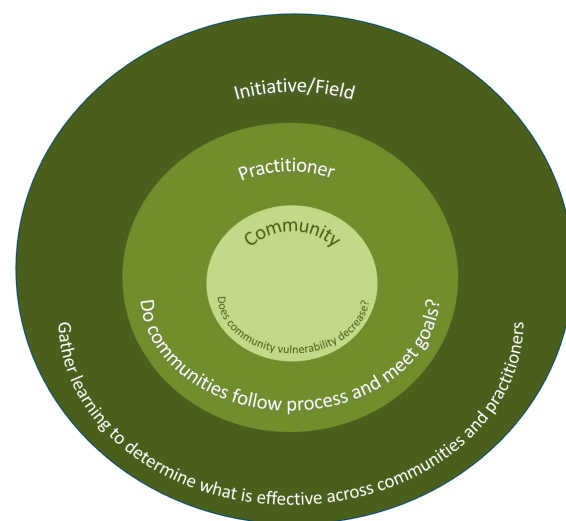
Results of the monitoring results will lead to review and possible modification of adaptation actions following consultation with the original participants in scoping and development of the adaptation actions, as well as additional stakeholders identified over the course of implementation and monitoring.



## APPENDIX B. M&E for the Climate Smart Community Initiative (CSCI)

Developing the field of adaptation will require action and learning at the local level, as well as a means to take local learning, apply cross-field level analysis, and understand patterns and causation of effectiveness in the update of process and practice. The goal of all this is to reduce local, societal and natural world risk and vulnerability to climate change. To achieve this, we will need monitoring and evaluation at all three levels of the CSCI process (Figure 7).

Figure 7. Levels of Monitoring and Evaluation



### Box 4: What does M&E mean for...

- |                |  |
|----------------|--|
| Community:     | <ul style="list-style-type: none"> <li>Understanding the progress toward developing and implementing adaptation actions</li> <li>Determining if an adaptation action is reducing risk and vulnerability</li> <li>Share learning with community and peers</li> </ul>  |
| Practitioners: | <ul style="list-style-type: none"> <li>Determine if the training materials are being understood</li> <li>Track the community's progress through the Steps to Resilience</li> <li>Share learning with current community, subsequent communities and peers</li> </ul>  |
| Initiative:    | <ul style="list-style-type: none"> <li>Analyze multi-site outcomes to determine:               <ul style="list-style-type: none"> <li>Utility of resources and training</li> <li>What adaptation actions are being taken</li> <li>Effectiveness of different adaptation actions across sites</li> <li>Frequency of barriers, enabling conditions, and maladaptation</li> </ul> </li> <li>Use analysis to create next generation guidance and tools</li> <li>Share learning with practitioners and the field</li> </ul> |

As mentioned previously, monitoring and evaluation at the project or site level inform local success through local engagement, while efforts to use monitoring and evaluation to build the field of adaptation will require regional and global engagement to synthesize learning from many local processes. This field-level monitoring and evaluation gathers learning across sites, using a range of common or unique adaptation approaches, and it is the natural combination of the process-oriented practitioner M&E which seeks to understand how well the community being supported is progressing, and the community M&E which seeks to understand how well their community is fairing. This full spectrum can be considered in Table 3.

**Table 3: Community vs. Practitioner vs. Field Level M&E: Sample M&E Questions for Five Aspects of Adaptation**

	Community	Practitioner	Field (CSCI)
Context and planning	Is the process participant pool right (e.g., diversity of participants reflects needs of topics being explored)?	Did the community intentionally identify participants, values, and assets? Were hazards mapped to assets?	How are communities identifying process participants, assets, and hazards?
Communications, engagement & capacity-building	Is there regular communication with community participants on the process and post-process actions?	Has local capacity been enhanced?	Is information being shared across the field? Is that information being used to build capacity for the field?
Decision making	Is there a climate lens through which to evaluate local decisions?	Is the community using the data and tools provided to inform decisions?	Are climate smart decisions being made more frequently? Are these decisions resulting in reduced vulnerability?
Implementation processes and accountability	Are other goals incorporated into the process (e.g., DEI, economy, environment)?	Are the Steps to Resilience being completed?	What Steps are most commonly completed? Where are their barriers to completion or advancement?
Assessing adaptation outcomes	Did the process lead the community to make any changes to local process or implement any adaptation actions? Are climate hazard impacts lessened?	Were adaptation actions taken? Are they being monitored? Are they effective?	Does completion of an adaptation process, such as the Steps to Resilience, result in reduced risk or vulnerability from climate hazards? Is maladaptation occurring?