Evaluating Climate Change Adaptation: Learning From Methods in International Development

Susannah Fisher, Ayesha Dinshaw, Heather McGray, Neha Rai, Johan Schaar

Abstract

This article reviews evaluation methods used in the field of international development to draw lessons for the specific challenges of evaluating climate change adaptation. The three specific challenges identified in climate change and resilience monitoring and evaluation are: assessing attribution, creating baselines, and monitoring over long time horizons. This article highlights a range of methods that can be used in climate change adaptation and concludes that, although the methods are available, it is how they are applied that can help address these particular challenges. Methods used within an overarching conceptual framework that emphasizes mixed methods, participatory methodologies, and an iterative, learning focus can start to address the inherent challenges in evaluating responses to an uncertain future climate. This type of approach and application of a set of methods can also be useful in other areas of evaluation, where the outcomes are very long term and socioeconomic trends are extremely uncertain. © 2015 Wiley Periodicals, Inc., and the American Evaluation Association.

The effects of climate change often challenge progress toward achieving development objectives by altering the underlying natural and social systems in which development takes place. Increasing
financial resources are being invested in climate change adaptation (Buchner et al., 2014), but more evidences are needed to shape future investments and to understand how these projects will perform over uncertain and distant climatic futures. One way to address these issues is through robust monitoring and evaluation that generates evidence and learning that is fed back into adaptation practice (Adaptation Committee, 2014). However, results frameworks for adaptation are often project-based, output-oriented, and tend to emphasize spending over results (Independent Evaluation Group of the World Bank [IEG], 2012). In large part, this is due to the challenges of building and assessing resilience to climate change occurring over an uncertain future, both in terms of the changing climate and also in terms of social and economic trends over time. This can lead to a focus on more tangible and therefore measurable outputs for the purposes of reporting and accountability to donors, but they risk being less relevant to assessing actual changes in resilience to climate change over time.

This issue draws on a review of methods and approaches in international development across the sectors of health, natural resource management, agriculture, and work in fragile states and conflict areas to identify methods that address the challenges of monitoring and evaluating climate change adaptation. The review is summarized in Table 1.1 (see Dinshaw, Fisher, McGray, Rai, & Schaar 2014 for a full review). These methods are explored in the context of different types of adaptation interventions—simple, complicated, and complex (Patton, 2011; Zimmerman & Glouberman, 2004; Zimmerman, Lindberg, & Plsek, 1998)—and three challenges for climate change adaptation and resilience (CCAR) monitoring and evaluation (M&E)—assessing attribution, creating baselines, and monitoring over long time horizons. This report was a synthesis of methods. This issue takes this evidence base and the report as the basis for further analysis, showing how adaptation evaluators can move beyond utilizing specific methodologies for M&E and develops an overarching approach to CCAR M&E.

The Challenges of Monitoring and Evaluating Climate Change Adaptation

To determine the most appropriate methods for monitoring and evaluating adaptation, it is useful to distinguish between interventions that have simple, complicated, or complex designs, depending on the degree to which there is agreement and the certainty that specific inputs will lead to specific outcomes. To summarize Patton (2011), simple interventions are those where there is a straightforward logic between inputs, outputs, and outcomes. Complicated interventions may entail multiple components or stakeholders over long time frames. Complex interventions involve fundamental uncertainties, and often disagreement, about the relationship between inputs and outcomes. A causal chain may only become apparent after
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<tr>
<td>Surveys</td>
<td>An investigation about the characteristics of a given population by means of collecting data from a sample of that population and estimating their characteristics through the systematic use of statistical methodology.</td>
<td>×</td>
<td>×</td>
<td>Heltberg, Hossain, and Reva (2012) conducted an extensive survey after the 2008 global food and financial crisis to provide a narrative from the perspective of those who were affected, and to provide feedback on a range of relief schemes that were implemented after the crisis.</td>
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<tr>
<td>Focus-group interviews</td>
<td>An interviewing technique whereby respondents are interviewed in a group setting, and the interaction between participants is part of the analysis.</td>
<td>×</td>
<td>×</td>
<td>International Fund for Agricultural Development evaluated rural development projects in Gambia, Ghana and Morocco (Leeuw &amp; Vaessen, 2009). The methods included desk reviews, quantitative surveys, and focus group discussions with project beneficiaries, control groups, and key informants.</td>
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<tr>
<td>Social science methods</td>
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<tr>
<td>Semistructured interviews with key informants</td>
<td>A one-on-one meeting with a set of questions to be discussed.</td>
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<tr>
<td>Most significant change analysis</td>
<td>Revolves around asking participants or beneficiaries to tell the stories of the most significant change they have experienced through the program (Davies &amp; Dart, 2005).</td>
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Used to evaluate the Department for International Development (DFID)–supported project on Community Driven Approaches to Address the Feminization of HIV/AIDS in India (India HIV/AIDS Alliance, 2007). The MSC technique helped promote accountability to beneficiaries by keeping program managers in touch with ground realities as well as continuous review and re-alignment of the program assumptions through learning.

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<tbody>
<tr>
<td>Outcome mapping</td>
<td>Identifying changes in the behaviors of the individuals, groups, and organizations with which program works, rather than changes in the physical variables that may correlate to the development program objectives.</td>
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<td>Outcome mapping on an education project in Zimbabwe used boundary partners, that is, the stakeholders the project wished to influence (in this case schools and teachers), in an evaluative process with the project team. The outcome mapping process relies on four methods: monitoring via self-assessment (by program stakeholders); encouraging feedback, reflection, and learning; promoting internal and external dialogue; and following up on unintended effects (Hyse &amp; Ongevalle, 2008).</td>
</tr>
<tr>
<td>Limiting factor analysis</td>
<td>Technique to develop a common understanding of the key factors that must be assessed, and if necessary (and possible) managed, for project or program to be viable over the long term.</td>
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<td>×</td>
<td>×</td>
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<td></td>
<td>Gullison and Hardner (2009) have identified a list of limiting factors relevant to a broad range of project types and ecological systems.</td>
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<tr>
<td>Social science methods</td>
<td>Scenario building Generates a set of possible alternative futures ranging from participatory scenarios to modeling data.</td>
<td>×</td>
<td>× × × ×</td>
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Feed the Future program is the U.S. government’s global hunger and food security initiative that seeks to reduce global poverty and hunger with sustainable development impacts. A tool has also been developed to facilitate target setting by using a series of national data to run scenarios and to set targets (U.S. Agency for International Development, 2012)
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<tr>
<td><strong>Experimental design with randomized controls</strong></td>
<td>Compares the treatment group (e.g., program participants) against a randomized control group (e.g., nonparticipants). Statistical techniques used to analyze results.</td>
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<td>Randomized control trials (RCTs) are often used in pharmaceutical trials to understand the effect of a drug compared to a control group.</td>
</tr>
<tr>
<td>Quasiexperimental design</td>
<td>Similar to experimental design with different rationales used to assign control groups. But this is undertaken in a nonrandomized way. Can be, for example, through a pipeline approach using groups at different stages of implementation. Analyzed with the use of techniques such as propensity score matching (PSM) and difference in difference.</td>
<td>×</td>
<td>×</td>
<td></td>
<td>×</td>
<td></td>
<td></td>
<td>The United Nations Capital Development Fund (UNCDF) in Nigeria, Malawi, Kenya, and Haiti evaluations used new clients, defined as those who had not yet received their first loan or those who had received their first loan but had not yet completed a full loan cycle, as the control group, and older clients, defined by those who had been in the program for at least 20 months, were the treatment group (White, Sinha, &amp; Flanagan, n.d.).</td>
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<tr>
<td>Modeling</td>
<td>The construction of physical, conceptual, or mathematical simulations of the real world.</td>
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<td>As part of the Lower Red River Meadow Restoration Project in Idaho, the project team took an approach that included a pre- and postevaluation (in 1994, and 2000 and 2003, respectively) of the river restoration area with the use of 17 performance indicators, comprising a suite of physical and biological components that interact within the river and wet meadow ecosystems (Klein, Clayton, Alldredge, &amp; Goodwin, 2007).</td>
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| Methodology and statistical techniques | Stochastic baselines | Captures different states that are not captured by different sets of variables but by probability distributions. This model can be useful as it can consider several alternative futures or scenarios. | Simple: × | Complicated: × | Complex: × | Long time horizons: × | The Food and Agriculture Policy Research Institute (FAPRI), focusing on the agricultural sector in the United States (Blanco-Fonseca, 2010) used a stochastic model to estimate a more comprehensive baseline that takes into consideration 500 different scenarios that vary in underlying assumptions about factors such as climate, supply and demand, and so on. |
| Rolling and reconstructing baselines | Collecting baselines during different stages of the program instead of at one time. Reconstructing baselines using secondary administrative data such as national surveys and some practical techniques such as recall and mapping techniques to reconstruct baselines. | Simple: × | Complicated: × | Complex: × | Long time horizons: × | The evaluation of Bangladesh Integrated Nutrition Project lacked baseline data to monitor implementation progress. Three separate secondary measurements were used to reconstruct the baseline and create a new comparison group with the use of propensity score matching (World Bank, 2010) |

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<tr>
<td>Normalization</td>
<td>Helps standardize data by different trends (unusual or usual) by adjusting the data against these trends and means.</td>
<td>Simple ×</td>
<td>[ ]</td>
<td>The evaluation of the Nutrition Care Process (NCP) program used indexing and composite scoring to normalize their evaluation metrics (such as anthropometric data, physical findings data, biomedical data, etc.) that are affected by variations in several health-related aspects. The standardization technique allows arriving at health and disease outcomes by providing comparable data (American Dietetic Association, 2008).</td>
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<tr>
<td>Propensity score matching</td>
<td>Statistical technique used by programs to construct a matched comparison group that has the same propensity to receive the intervention benefits as the treatment group.</td>
<td>Simple [ ]</td>
<td>[ ] Complex [ ] [ ] Attribution Baselines/Targets [ ] Long-term horizons [ ]</td>
<td>The Emergency Social Investment Fund of Nicaragua used in 1998 the World Bank's Living Standard Measurement Study (LSMS) data to estimate baselines for project and comparison groups in water and sanitation, health, and education projects. PSM was used to enhance comparisons between the two groups (Pradhan &amp; Rawlings, 2002; World Bank, 2010).</td>
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<tr>
<td>Difference in difference</td>
<td>Compares impacts between treatment and control (comparison) groups both before and after the implementation of an intervention.</td>
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<td>×</td>
<td>The approach used to evaluate the impact of the Nicaraguan conditional cash transfer program, Red de Protección Social, on changes in household expenditure on food, improved health care, and the nutritional status of children (Moore, 2009).</td>
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<tr>
<td>Regression analysis</td>
<td>Shows the degree of variation of samples around a linear or nonlinear relationship, and thus the statistical significance of the relationship.</td>
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<tr>
<td>Contextual monitoring</td>
<td>Monitors external trends or contexts.</td>
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<td>In Nepal DFID uses qualitative data from a range of sources to monitor various indicators that are likely to influence program outcomes. This includes indicators on communal violence, human rights abuses, rule of law, and the role of representatives of marginalized groups in political institutions (DFID, 2012).</td>
</tr>
<tr>
<td>Sequential targeting</td>
<td>Sets interim targets or several milestones that relate to expected performance over short intervals and are revised over time.</td>
<td>X</td>
<td>X</td>
<td>DFID Violence Against Women and Girls (VAWG) programs aim to change social norms and ultimately prevent violence against women in a number of developing countries. However, long-term targets to achieve desired change in social norms are difficult to predict. VAWG evaluations therefore focus on sequential targeting to evaluate the long-term changes in social norms and reduced violence realistically (DFID, 2010).</td>
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<tr>
<td><strong>Monitoring and evaluation tools</strong></td>
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<tr>
<td>Contribution analysis</td>
<td>Focuses on how an intervention interacts with other aid or nonaid factors and analyzes whether an intervention was a necessary and/or a sufficient causal factor, along with other factors.</td>
<td>×</td>
<td>×</td>
<td>Broad thematic evaluations such as those carried out by the Organisation for Economic Co-operation and Development—Development Assistance Committee [OECD DAC] on donor gender mainstreaming (OECD, 2011) use a contribution approach.</td>
</tr>
<tr>
<td>Theories of change</td>
<td>An articulated theory of how the anticipated change will come about and the contribution to this of any activities.</td>
<td>×</td>
<td>×</td>
<td>A review for Care International has found that Theories of Change have a critical use in peace building. The review suggests that this approach helps deal with underlying assumptions, identifies aims and objectives, clarifies project design, and makes more explicit links between local level activities and national peace processes for desired changes to occur (Care International, 2012).</td>
</tr>
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</table>
a climate event, or there may not be an end state at which point the problems have been resolved (Rogers, 2008).

For simple interventions, where there is agreement and certainty, well-established monitoring and evaluation methodologies used in international development and other areas can be used to understand progress in the short to medium term. More complicated adaptation initiatives, where there is agreement but less certainty, may require a broader set of approaches (Rogers, 2008). However, many adaptation initiatives are complex, and the fundamental uncertainties associated with climate change create particular challenges for evaluation.

The challenges to consider in the M&E of adaptation of these types of interventions include attributing observed change to specific activities within complex contexts, setting baselines and targets with changing climatic hazards, and assessing the effectiveness of adaptation initiatives with long-term benefits within short- and medium-term evaluation cycles (Lamhauge, Lanzì, & Agrawala, 2012). Theoretical frameworks for monitoring and evaluating adaptation that have emerged in recent years at the project, program, and fund levels (Bours, McGinn, & Pringle, 2014; Brooks et al., 2013; Olivier, Leiter, & Linke, 2013; Pringle, 2011; Spearman & McGray 2011; Villanueva, 2011) provide overarching guidelines within which adaptation M&E can be conducted. However, adaptation planners and practitioners have struggled to find the methods within those guidelines to address the challenge of combining accountability to donors, measuring results within the program or funding cycles, and considering the more particular challenges of assessing the effectiveness of climate change adaptation over the long term. This article therefore focuses on the appropriate methods that may be of use within these broader frameworks and an overarching approach to improve CCAR M&E.

**Monitoring and Evaluation Approaches and Techniques Useful to Adaptation**

Table 1.1 summarizes the evaluation methods reviewed for this article to address challenges in simple, complicated, and complex adaptation, including issues of attribution, shifting baselines and targets, and evaluation over long time horizons. The table shows what type of adaptation the methodology can address as well as which challenges it deals with.

We next discuss how the methods presented in the table can address each challenge for adaptation M&E, and the lessons learned from their application in other fields that are relevant to CCAR.

**Addressing Attribution or Contribution**

Demonstrating attribution can be challenging when interventions are complex or when the adaptation component is a relatively small part of a larger...
development program. This has been a long-standing challenge in international development and there are a variety of methods shown in Table 1.1 that can provide evidence on this issue, including social science methods such as focus groups and semi-structured interviews, statistical techniques and experimental or quasi-experimental research design and analysis. From the review of these methods and how they have been applied, we can draw several lessons for the evaluation of CCAR. First, when counterfactuals are not available, they can in some cases be inferred through quasi-experimental or participatory methods, but there will also be complex contexts where the nature of climate change is not well understood and it is difficult to establish a counterfactual. This is also the case in other instances of environmental policy (Ferraro, 2009). In complex contexts, it may be more meaningful to examine the contribution of an intervention to the observed outcome rather than to look for a direct causal attribution (Kotvjos & Shrimpton, 2007; Mayne, 2001). Second, to understand how to address attribution or contribution we must understand the mechanism that leads to the outcome—that is, the theory of change. Through theories of change, assumptions are made clear from the beginning, and mid-term goals can feed into long-term goals and thereby make the measurement or assessment of these pathways easier (Weiss, 1995).

**Baselines and Target Setting**

Different types of baseline and target-setting techniques are used in international development to address unknown future trends in societies and ecosystems (Dinshaw et al., 2014). To address the challenges of climate adaptation, these techniques need to take into account the shifting baselines of climate hazards and therefore moving targets for what is defined as “success.” This can be particularly challenging, as the data on past or future climate trends may not be available, and future climate change is surrounded with uncertainty. As shown in Table 1.1, methods used in international development to address this challenge include surveys, various techniques for adjusting baselines and targets over time to a variety of futures, normalizing results for changes in underlying trends and contextualizing them with a narrative. The review in Dinshaw et al. (2014) shows that there are a range of existing techniques, including normalization and contextualization, that can contend with the shifting baselines specifically in adaptation projects. There are also techniques to monitor the changing external context and the interaction with project outcomes (Department for International Development, 2010; Hargreaves, 2010). When external factors change, indicators may need to be modified in order to reflect this change and sequential targeting may help define gradually evolving objectives. When necessary, baselines can be reconstructed and continually updated (Gakhar, Kaur, & Kapur, 2010; Pradhan & Rawlings, 2002; World Bank, 2010). Although there is a variety of methods that can be used to assess attribution and
baselines and targets for interventions that focus on current climate variability, long-term horizons remain a particular challenge for the M&E of interventions seeking to build longer-term resilience to future climatic threats.

**Uncertainty and Long Time Horizons**

Although many development interventions need to be implemented and monitored over a long time, for example, improving an education system or enabling the transition to a democratic political structure, it is possible to know what success looks like for these interventions. However, what success looks like for adaptation to a changing climate is less clear, because there is uncertainty about both non-climatic and climatic futures. Although all development and conservation interventions are subject to uncertainty about the context, such as political situations and funding, adaptation projects are also subject to uncertainty about how the climate will change, how rapidly, and whether the models to predict this change are reliable and available at appropriate scales. Given the long-term nature of climate change, adaptation interventions that are building resilience to an uncertain climate future need to be monitored over long periods of time. However, there is no definite point at which evaluators can determine that a system or community has fully adapted while the climate is still changing.

There are relatively few methods for contending with uncertainty and long time horizons for CCAR M&E. The relatively few examples of longitudinal evaluations available include broad thematic evaluations such as those carried out by the Organisation for Economic Co-operation and Development (OECD), Development Assistance Committee on donor gender mainstreaming (gender mainstreaming being a process of considering the needs of both men and women in all forms of policies, processes, and implementation to support the goal of achieving gender equality) (OECD, 2011), the effectiveness of budget support (OECD, 2012), and a study by the United Nations Development Programme (UNDP) on a decade of efforts on strengthening national capacities in disaster risk management and recovery (UNDP, 2010). Another example of long-term monitoring is when a development agency evaluates a whole scope of programs over their entire period of implementation, such as the Sida evaluation of its support to Vietnam, Laos, and Sri Lanka (McGillivray, Pankhurst, & Carpenter, 2012). However, this type of long-term evaluation is rare for specific projects, and there are few methods that help with monitoring and evaluating adaptation over long time horizons. One method that is used in biodiversity conservation that may be applicable to ecosystem-based adaptation is limiting factor analysis, wherein the evaluators preemptively identify a list of factors that could limit the effectiveness of the project in the future and consider how to adjust program design accordingly (Gullison & Hardner, 2009). A similar approach being tested and developed is the Theory of No Change, which came out of a meta-evaluation of climate change mitigation evaluations...
supported by a community of practice hosted by the Independent Evaluation Office of the Global Environment Facility (GEF IEO). This theory enables evaluators to hypothesize why certain causal links may be broken or why interventions are not working in given circumstances (Woerlen, 2013).

**Employing an Overarching Approach To Improve Monitoring and Evaluation of Climate Change Adaptation**

In order to contend with the challenges of evaluating adaptation projects described in this volume—creating baselines, establishing attribution, and monitoring over long time horizons—evaluators need to move beyond employing specific M&E methodologies to address particular questions. There are three overarching approaches to M&E that could make CCAR M&E more effective when used within a conceptual framework: using mixed methods, including or adopting participatory approaches, and incorporating learning into the ongoing monitoring and evolving design of an intervention. Using such approaches within an overall conceptual framework that links them together, and theorizes the links between the chosen methods and key elements of the climate challenge in question, will go some way to addressing the challenges identified in this article.

**Mixed Methods**

Different M&E methods have different strengths and weaknesses in addressing the core challenges for climate change adaptation. However, we can see from their application in other development projects that they can be used together to complement each other, and using mixed methods can address some of the challenges of complicated or complex interventions. When applying different methods, a careful assessment of the underlying assumptions is required to ensure that the evidence gained from each method is compatible.

For example, to monitor and evaluate an intervention that provides monetary incentives and training to farmers to increase their resilience to climate change through land use change, a portfolio of methodologies was used (Leeuw & Vaessen, 2009). The methods included quantitative methods (e.g., experiment-related methods, econometrics, and statistical analyses) that enumerated outcomes, such as income levels, agricultural productivity, or access to services. Complementary qualitative methods examined how change had come about with the use of surveys, focus-group interviews, and participatory techniques. Each methodology had its comparative advantage that, when brought together, provided a more complete picture of the intervention outcome (Leeuw & Vaessen, 2009).

Generally, evaluation designs that use different types of methods offer opportunities for triangulation and complementarity and thus a deeper understanding and conclusions about causality. Using mixed methods can
help assess the different aspects of contribution of the intervention to overall adaptation success. However, mixed methods do not help evaluators much with the challenges of setting baselines or monitoring over long time horizons.

**Participatory Approaches**

Participatory monitoring and evaluation is particularly valuable in complex adaptation contexts to assess changes in attitudes and decision making, to examine the impact and effectiveness of interventions, to create baselines and comparison groups, and to build ownership or recommendations. Data gathered in a participatory manner are only one input into monitoring and evaluating these contexts, but offer a methodologically simple way of understanding impacts on livelihoods and household experiences that may be difficult to capture through a set of indicators. Participatory methods capture unintended consequences and impacts, and involving beneficiaries and a wide range of stakeholders also ensures that evaluations are grounded in local realities. For instance, Heltberg et al. (2012) conducted an extensive survey after the 2008 global food and financial crisis to provide a narrative from the perspective of those who were affected, and to provide feedback on a range of relief schemes that were implemented after the crisis.

Participatory approaches can be very helpful in ensuring that the contributions of various elements to the success of the intervention are well understood. If this practice is continued throughout an intervention, evaluators can create and test narratives of attribution and theories of change (Brooks et al., 2013). However, sustaining participation for the purpose of monitoring interventions over long time frames may be challenging, and also places demands and potential opportunity costs on participants who may not directly experience the benefits of the activities (Cooke & Kothari, 2001).

**A Focus on Learning**

What makes a method most appropriate to climate change adaptation is not necessarily its intrinsic qualities, as this is highly contextual depending on the objectives of the intervention, but instead how the method is applied. One way to address the uncertainty and lack of information that challenge CCAR M&E is by applying methods that emphasize iterative monitoring techniques and enable learning over time. Several of the techniques identified in Table 1.1 can be used iteratively and with a focus on incorporating learning into the ongoing evaluation. For instance, a single baseline can be developed at the beginning of an intervention and then used for the duration of the intervention. Alternatively, the evaluators can make use of rolling baselines that are developed during different stages of the program, or stochastic baselines that are created for several different scenarios that vary in their underlying assumptions. These iterative techniques
enable more flexibility to include learning and adjustment throughout the intervention.

Possible limitations of these methods include the capacity required to generate multiple baselines, some of which could include complex computational modeling, and the ability to interpret the new information generated continuously (Blanco-Fonseca, 2010). Furthermore, the application of rolling baselines may cause a bias where the program inputs and the outputs or outcomes become correlated with other factors that cannot be controlled or predicted. In this case, normalization techniques can enable the evaluator to separate and quantify the impact of different influencing factors on the final outcome (Pradhan & Rawlings, 2002).

Developmental evaluation is an existing overarching approach to address complex evaluation problems and contexts, which is suitable for CCAR M&E. It is a form of in-built, iterative evaluation that aims to help program staff use evaluation findings throughout the program cycle and in the ongoing refinement of the program (Patton, 2011). Developmental evaluation has a focus on systems and problems that are complex, characterized by uncertainty and dynamic change. It does not refer to a specific set of methods or tools but rather a mindset of inquiry, and is thereby focused on bringing data and lessons from the evaluation process into the ongoing program through careful timing and stakeholder participation. Rather than performing evaluations based on a predetermined schedule, developmental evaluations seek to coincide with annual workflow plans, major implementation steps, and decisions about the future of programs (Patton, 2011).

**Conclusion**

Adaptation M&E can and should learn from the M&E experiences in other fields. There is a wide range of experience and tested methods that can help address issues of attributing impacts and some aspects of uncertain futures. However, it seems clear that the particular issues of uncertainty about climate change and the long time horizons over which adaptation interventions need to be implemented can make the monitoring and evaluation of complex interventions in this context particularly challenging. Therefore, we must move beyond employing specific methods and techniques in isolation, but select and combine those that together provide sensitivity to the challenges of uncertainty and longer time frames. As the experience of M&E in the field of climate change adaptation evolves, it will offer important lessons to those carrying out evaluations of complex interventions in other areas and into distant futures of high uncertainty.

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