A Review of Monitoring and Evaluation Approaches for Ecosystem-Based Adaptation

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Glossary

TERM	DEFINITION
Adaptation deficit	A failure to adapt to current climatic conditions because of a low level of development (for example, inadequate housing structures to deal with extreme weather, a lack of access to credit for investing in new crop varieties, or limited technical expertise to manage a natural buffer to the effects of sea level rise).
Adaptation gap	A failure to take action to address issues that arise as a consequence of existing or anticipated climate variability and change (for example, being better equipped to deal with extreme weather events, having buffers against droughts, and dealing with changes in cropping patterns resulting from temperature rise).
Adaptive capacity	Potential or capability of a system to adjust to climate change, including climate variability and extremes, so as to moderate potential damages, to take advantage of opportunities, or to cope with consequences.
Climate proofing	Identifying risks to development interventions, or any natural or human asset, as a result of climate change and climate variability, and ensuring that those risks are reduced to acceptable levels. Climate proofing is meant to improve the likelihood of sustaining intervention results and helps improve adaptation strategies that can better inform adjustments to interventions.
Effectiveness	The extent to which an intervention's objectives have been, or are likely to be, achieved.
Evaluation	Evaluation is the objective assessment of an on-going or completed set of activities, such as a project or program, according to its design (initial plans), implementation (execution, outputs) and results (outcomes, impacts).
Exposure	The extent to which people, property, or systems are in a hazard zone and subject to harm or loss. Measures of exposure can include the number of people or types of assets in an area. These can be combined with the specific vulnerability of the exposed elements to any particular hazard to estimate the quantitative risks associated with that hazard in the area of interest.
Maladaptation	Exacerbating climatic pressures or effects, including increasing greenhouse gas emissions, disproportionately burdening vulnerable populations, causing high opportunity costs for actions taken, reducing incentives to adapt, or causing path dependency by narrowing or eliminating future options.
Monitoring	Monitoring is systematic observation and collection of data on the progress or quality of something, such as tracking the number and gender of workshop participants, measuring annual growth of saplings, or counting the number of new sector policies that account for or address climate change.

Resilience	The capacity of a system to experience shocks while retaining essentially the same function, structure, feedbacks, and therefore identity. This could be determined by the degree to which the social system is capable of organizing itself to increase capacity for learning from past events for better future protection and to improve risk reduction measures.
Sensitivity	The extent to which a system is affected—positively or negatively—by climate variability and climate change Measures may include bio-physical effects that can be altered by socio-economic factors.
Vulnerability	The degree to which a system is susceptible to, and unable to cope with, the adverse effects of climate change, including climate variability and extremes. A function of the exposure, magnitude, and rate of climate change and variation to which a system is exposed, as well as its sensitivity and adaptive capacity.

Introduction

MONITORING & EVALUATION (M&E) AND CLIMATE CHANGE ADAPTATION

The topic of 'monitoring and evaluation' (M&E) of climate change adaptation in developing country contexts, and, in particular, devising ways to assess the effectiveness of adaptation efforts, has gained particular attention for several reasons and for several sets of actors[1] (See Glossary for key terminology). For example, in an era of increasingly limited public funding, international donors want to determine how best to invest their limited resources in existing and new bilateral and multilateral funds. National and local governments in developing countries also face the pressures of managing existing and expected climatic pressures on their respective development agendas. Practitioners and planners seek tools and other resources to help them choose the most relevant and effective adaptation strategies for their interventions. Finally, through the use of information and lessons learned generated by M&E, populations most vulnerable to climate change can improve their awareness of options and best practices on adaptation, thereby increasing the likelihood of protecting their lives and livelihoods in the face of climate change.

M&E of adaptation is, however, challenging because of scientific uncertainties, (rapidly) changing circumstances against which progress is measured (a "shifting baseline"), and sometimes a lack of resources and expertise necessary to assess technical, cross-sectoral and multi-scale efforts, such as watershed management in light of climate projections. Also, obstacles to practicing effective M&E include insufficient capacity to develop, manage, and execute M&E plans; meeting the technical challenges of identifying, collecting, and analyzing relevant data; and formulating clear objectives while there are practical disagreements between various implementing partners and funding institutions on core concepts and objectives of adaptation (See Glossary). Along with the challenges and obstacles to M&E of adaptation efforts, there is increasing demand from the various actors mentioned above for additional and improved monitoring, reporting, and quality of assessment of adaptation efforts. This need includes the use of M&E for learning, expanding the use of participatory approaches to M&E, and helping to develop standardized principles and guidelines for measuring effectiveness in practice.[2] Using M&E as a learning tool is especially important for testing out and broadening the usage of innovative approaches to adaptation, including, for example, ecosystem-based adaptation.

ECOSYSTEM-BASED ADAPTATION AND M&E

This paper explores approaches to monitoring and evaluation of *ecosystem-based adaptation* (EbA) strategies. Ecosystem-based adaptation (EbA) has been interpreted and defined in a variety of ways,[3] but for the purposes of this paper, EbA is "*The use of biodiversity and ecosystem services in an overall adaptation strategy. It includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt to the adverse effects of climate change.*"[4] Successful strategies ensure the continued supply of goods and services of particular importance to the world's poor and most vulnerable, in the form of income and shelter, but can also be highly significant to populations that may not be considered particularly vulnerable.[5] EbA means harnessing the capacity of ecosystems to provide goods and services in the face of climate variability and climate change.[6] In addition, using ecosystems and the services they provide[7] to support human adaptation also often results in other important co-benefits, such as maintained or enhanced biodiversity and/or climate mitigation through increased carbon storage and sequestration.

The unique principles of an EbA approach (expanded on in section 2.b.)—where relevant or appropriate to the particular context of a project—and around which M&E tools and methods might be used to assess its effectiveness, include:

- Promoting the resilience of both ecosystems and societies, including livelihoods;
- Using comprehensive nature-based solutions for populations that are particularly vulnerable due to socio-economic and/or climatic conditions, and/or those that are particularly reliant on natural systems for their basic needs and well-being;
- Producing development and environmental co-benefits beyond the scope or scale of a specific intervention, such as resulting in emissions reductions, carbon credits, improved environmental quality, increased raw material, improved ecosystems services, etc.[8]

Good M&E of EbA is a reflection of good practices in M&E for adaptation that also captures the specific evidence for how and when an EbA approach is most (in)effective. Assessing the effectiveness of an EbA intervention depends on its objectives and on the relevance of those objectives to the context in which activities take place (See Glossary for terminology). In short, there are two types of effectiveness; whether the project performed as intended, and whether—in light of current or expected climatic changes—that performance resulted in reduced vulnerability of target populations and the natural systems in which they live. Furthermore, since EbA is both a set of possible methods and strategies, as well as a set of possible results from those strategies, M&E systems must capture each of these aspects of EbA in order to understand effectiveness. Since EbA is an emergent area, however, the basis for decision-making and use of information in the practice of EbA is currently lacking.[9] M&E helps practitioners gather and share information, enable adaptive management, track underlying assumptions, manage risks and uncertainties, meet transparency and reporting requirements, and, most of all, in the context of adaptation, learn which approaches and strategies best apply to which contexts and needs. M&E is a set of tools and methodologies with the potential to help demonstrate results and identify lessons learned and best practices for EbA approaches.

PAPER SCOPE AND CONTENTS

This paper explores how various organizations and practitioners have approached the design and use of M&E tools and approaches to record results and assess EbA projects and programs. Our research is based on a desk review of documentation on frameworks and approaches to EbA (See Table 1), discussions among members of the Africa Biodiversity Collaborative Group (ABCG),[10] and interviews with practitioners currently developing EbA projects and/or programs.

Section 2, Formulating Monitoring and Evaluation Systems for EbA Projects, expands on four key questions:

- When and how is an EbA approach considered in the project planning process?
- Around what criteria are objectives formed and effectiveness assessed?
- What are the unique challenges and/or opportunities posed by M&E of EbA, if any?
- What are the implications of findings on the questions above for adaptation efforts more broadly?

Section 2.a. below explores the various perspectives through which an EbA approach is chosen alongside or instead of other adaptation approaches, and how the criteria for expected benefits has implications for choosing measures of success.

Section 2.b. outlines the implications and options for designing an M&E plan based on good practice in M&E for adaptation and the 'principles of effective EbA,' and draws out potential compatibilities and incompatibilities of applying various common M&E tools and methods to EbA approaches.

Section 3, *Initial Planning for M&E of Two Example EbA Projects*, then highlights the development of M&E systems for two EbA projects[11] currently under implementation, and examines the factors that shape their M&E plans.

Finally, Section 4, *Lessons and Conclusions*, summarizes lessons drawn from this paper on the application of M&E to ecosystem-based adaptation strategies and concludes with a summary of key points.

Formulating Monitoring and Evaluation Systems for EBA Projects

WHEN AND HOW IS AN EBA APPROACH CONSIDERED IN THE PROJECT PLANNING PROCESS, AND BY WHAT CRITERIA IS ITS EFFECTIVENESS ASSESSED?

There are many reasons why EbA approaches are (or should be) considered at the beginning of the adaptation planning cycle alongside other adaptation options, and many of these reasons overlap and interact with one another both in planning and in execution. Broadly speaking, EbA strategies may complement (or enhance), replace, or in certain circumstances, represent the only tractable option, in consideration to other adaptation options.[12] However, the opportunities for EbA are particularly germane where they:

- ***Reduce existing socio-economic vulnerability specifically arising from biophysical circumstances***. Sustainable land-use and planning that supports conservation efforts can reduce vulnerabilities associated with climate change and climate variability by meeting basic development needs through increased access to income generating activities (or reductions in loss of income) and/or supply of raw materials.
    - Example: The livelihoods of subsistence rain-fed agricultural communities who share forest commons in India are highly vulnerable to existing variability. Sustainable land-use practices and appropriate agricultural technologies can help improve water quality and food security and reduce pesticide and other chemical loads. This, in turn, makes farmers less susceptible to market conditions and price fluctuations, and less dependent on outside resources or materials to gain income and meet basic needs in the face of current and likely near-term climatic fluctuations.[13]
- ***Enhance climate change and disaster risk management policy and planning through identifying and targeting the conservation of multiple ecosystem services***. Integrated environmental and natural resource management approaches can be incorporated into disaster risk reduction planning, whether based on structural or non-structural measures, such as flood management and restoration of fragile ecosystems.[14]
    - Example: Ecosystems and ecosystems services provide the foundation for the government of the Maldives' "Safer Islands" strategy, which seeks to better secure local human and natural assets by forming "ecological safe zones" and structures that mitigate the impacts of heavy rains, tidal surges, flooding, and other hazards such as tsunamis. The government then integrates lessons on use of these protective zones into improved DRR and management policy.[15]
- ***Provide value for money and/or efficiency through the delivery of multiple co-benefits for human systems and natural systems.*** Fully accounting for subsidies and externalities may reveal that the economic, environmental, and/or social costs of an alternative, non-EbA

adaptation strategy, are far greater than an EbA approach, and/or that the EbA approach provides greater co-benefits relative to up-front costs of implementation.[16]

- Example: The financial benefits of local income generation from a shrimp farm in the Philippines may be less than the more integrated, widespread, sustainable economic and environmental benefits of an intact mangrove forest that supports community adaptation in the face of storm surges. The mangroves provide steady monetary and biophysical benefits relevant to climatic variability and extremes, whereas the shrimp farm's monetary benefits will need to be further converted to measures of enhanced resilience or adaptive capacity.[17]

- ***Improve direct biophysical resilience to anticipated hazards/extreme events.*** Ecosystems can provide protection or other benefits (biophysical support in the form of water absorption or ground water replenishment, for example) to communities or populations likely to become negatively affected by increased exposure and/or sensitivity to climatic conditions.
  - Example: Channel-clearing of wetlands, stabilization of riverbanks, and improved water management in Northern Mali has improved surface water volume and reduced local vulnerability to chronic extreme drought. This has improved the livelihoods of over 200,000 people, providing better food security through cultivation and fisheries.[18]

- ***Reduce the likelihood of inducing or encouraging mal-adaptive behavior or results*** (See Glossary for glossary of terms). Approaching adaptation through "low regrets" or "no regrets" EbA strategies presents opportunities to use scientific and indigenous understanding of ecosystems, the services they provide, and the ways in which economic and political patterns shape use of natural resources. By devising solutions that address multiple dynamic systems, with a long-term perspective, the measures taken help reduce the risks that the project will inadvertently increase vulnerability or reduce adaptive capacity or resilience of human or natural systems in the face of climate change.[19]
  - Example: Modern crop varieties typically have to be bought each season, depend on market availability and quality, and are often protected by intellectual property rights (IPRs). These crop varieties also often rely on fertilizers and pesticides and are not necessarily resilient to climate variability and/or expected climatic changes. Alternatively, communities can draw on a 'natural gene bank' of resilient crop varieties and harness traditional practices that preserve and cultivate species that tolerate extreme weather and soil conditions. The communities of the highlands and valleys of Cochabamba, Bolivia, for example, are able to use native plants for biocontrol and adopt more resistant and flexible local crop varieties. This enables them to not only to avoid mal-adaptive practices leading to food insecurity, but also continue to conserve agrobiodiversity and broadening the genetic base in breeding.[20]

Guidance documents and reports on emerging lessons on EbA approaches have mostly indirectly addressed the issue of M&E. This is partially because many of the tools and resources available are intended more as planning tools for integrating climate change projections into existing or new projects. In other cases, guidance focuses on developing M&E systems for adaptation interventions even though EbA approaches may not be the primary type of adaptation intervention under consideration. Table 1 below examines key documents produced by several leading institutions and organizations that have developed research and/or a portfolio of case studies from which lessons and findings can be drawn on planning and implementing EbA projects and programs. The table illustrates the wide variety of interpretations for how and why EbA might be considered useful and/or successful, thereby emphasizing that current practice is not yet at the stage of applying a single set of criteria setting goals for all EbA interventions.

Table 1. Organizations and Institutions Measuring EbA Effectiveness

Source	How and/or when EbA should be considered?	What are the criteria for effectiveness or definitions of success of EbA?
CARE/IIED[21]	• As an option posed though a participatory approach to project development • Capture in planning and describe alongside climate context (risks, hazards) as input to identify vulnerable groups, • Map "gateway" and 'core systems' (energy, water, communication, transport, and ecosystems)	• Support ecosystems/services especially important to the livelihoods and/or assets of the most vulnerable communities • Improvement in inequalities over time • Identify/clarify what changes in ecosystems/services are important for which groups of people (enables learning)
CATIE and partners[22]	• As part of an overall policy-making and planning process for adaptation • Through a vulnerability assessment, considering climate and non-climate threats and existing 'coping strategies' • Identify ecosystems and boundaries, and focus on those that are most important to stakeholders in light of trade-offs	• Fulfill the principles of EbA approaches[23] • Positive changes as assessed by vulnerability ranking tools[24] • Long-term resilience uncompromised by short-term actions • Strategies coherent with wider adaptation strategies, national and sector policies, and international conventions • Communities involved in monitoring processes enables equitable learning, strengthened awareness, and/or decision-making
Convention on Biological Diversity (CBD)[25]	• As part of overall adaptation strategy that integrates science and traditional knowledge • Through a vulnerability and/or risk assessment • Recognize and incorporate potential economic and non-economic trade-offs • Focus on vulnerable sectors and communities • Employed through adaptive management and scenario planning	• Cost-effectiveness of natural systems • Generation of social, economic and cultural co-benefits at multiple scales and time periods • Contribution to the conservation and sustainability of biodiversity • Improve quality of ecosystem services by rehabilitating degraded or fragmented systems • Accessibility and cultural appropriateness to poor and rural communities • Integration of indigenous/local knowledge • Increase understanding of links between biodiversity, ecosystems, climate change, and human society

Source	How and/or when EbA should be considered?	What are the criteria for effectiveness or definitions of success of EbA?
GISP[26]	• Identify key ecosystems and services to inform vulnerability and/or risk assessments, planning and prioritization for regulating invasive specifies and pathways of introduction • Consider how invasive species are affected by climate change, and how their responses affect biodiversity and ecosystems that provide critical services in a changing climate • Proactively assess the potential for biological invasion associated with adaptation activities designed to meet human needs	• Preventing the introduction, establishment or spread of invasive species that put pressures on ecosystems and their ability to provide services under a changing climate • Tracking and reducing the impacts of invasive species that are known stressors to biodiversity important to ecosystems resilience in light of climate change • Increasing ability of species and ecosystems to withstand climate-related impacts • Provide robust evidence to inform the design of better management strategies
TNC[27]	• In tandem with forms of societal adaptation in a multi-stakeholder driven process • As part of incorporating adaption into conservation planning approaches and efforts • Through interpreting and using climate data to narrow ecological and other uncertainties, and support decision-making • As part of an impact assessment that identifies climate change sensitivity and exposure of human and natural systems (including exposure of sensitive aspects of species life cycles or processes that shape ecosystems) to then assess vulnerability and formulate priorities	• Sustain human needs (water, food, natural resources) and protect against natural hazards (flood, drought, fire) while preserving biodiversity • Reduce the stresses of climatic changes on species and climate-induced disturbances to habitat—e.g. with resistance, resilience and response options[28] • Conserve biodiversity of highest priority based on climate projections and exposure, sensitivity; thereby meeting “climate adapted” targets • Apply appropriate adaptation approaches[29] to eco-regional and regional conservation assessments • Raise public awareness of climate change threats to biodiversity
UNEP and partners[30]	• Systematically and proactively consider alongside other more reactive and/or ‘hard’ options • Multiple possible entry points in the project cycle • Use of perceptions (vulnerability is a subjective term) and a systems-perspective in project design	• Fulfill the principles[31] of effective EbA • Form strong links between activities and context—the spatial and temporal dimensions, and focus of planned actions • Participation and engagement of implementing and broader constituent groups to capture and incorporate perceptions of ecosystems • Use pressure, response, state and benefits to shape indicators[32]

Source	How and/or when EbA should be considered?	What are the criteria for effectiveness or definitions of success of EbA?
WCS[33]	• Use a vulnerability assessment to identify community capacity to respond to climatic conditions, document exposure and coping strategies • Identify ecosystem values (natural, economic, social, cultural) to the community • Capitalize on mutually supportive aspects of EbA and community based adaptation (CbA) by utilizing strong traditions of local governance, communal resource tenure and traditional and local ecological knowledge • Address cross-sectoral nature of EbA by engaging a variety of appropriate institutions and/or helping establish new ones	• Reduce vulnerability to climate change impacts and increase resilience, while maintaining ecosystems and livelihoods in the face of climate change • Reduce climate-related (habitat) disturbances to ecosystems • Reflect the interconnected nature of ecosystems and their multiple natural, social, cultural and economic values • Effective use of science through experiential learning, education, outreach • Involvement of stakeholders in collaborative partnerships to enhance resource management effectiveness • Strike a balance between short-term costs and long-term benefits of maintaining or restoring ecosystems
World Bank[34]	• Integrate biodiversity into national, regional, district and sub-district land-use planning and policy (including infrastructure, transport, agriculture) • Focus on core threats or risks for each country based on climatic data • Use improved management of ecosystems and natural resources as a means to build resilience and reduce vulnerability of specific sectors	• Enhance goods and services (primary production, availability of raw materials) and improve human health and livelihoods for the most vulnerable sectors (rain-fed agriculture, hazard sensitive activities) • Enhance existing protections of natural systems (that may benefit biodiversity and/or infrastructure) • Cost-effectiveness through using protected areas and habitat conservation for improved multiple environmental flows and protection of investments

Based on the resources described in Table 1, it appears that choosing an EbA approach often occurs in the early stages of project planning and design, often prior to a site-specific vulnerability assessment. In approximately half of the guidance documents (CATIE and partners, CBD, GISP, TNC) EbA is to be incorporated into the design and planning of interventions through a vulnerability assessment; in such cases the findings from a risk and/or vulnerability assessment act as a basis for outlining options for (and barriers to) specific EbA strategies. Also, whereas some guidance (TNC, GISP) appear to focus on the entry point of incorporating climate change into biodiversity and conservation efforts, others (CARE/IIED, CATIE, WCS) start from a point of integrating climate change into participatory planning for human systems and livelihoods. The World Bank report emphasizes sectoral policy and national-level interventions (though CATIE points out that local projects need to align with national systems), while UNEP centers on the project cycle and its potential multiple entry points for utilizing EbA approaches to address climate change. Each guide supports the need to focus efforts on the highest priority actions (relative to the most vulnerable human populations), while recognizing the complementarities, trade-offs and interrelationships between EbA approaches and other ongoing adaptation measures (whether 'hard' or 'soft'). Finally, in each of these guidelines, the integration of both science and indigenous or local knowledge is a key feature in developing EbA approaches, as well as encouraging a strong emphasis on utilizing adaptive management tools and strategies.

In terms of criteria for success, EbA projects are successful according to these guidelines and reports in Table 1 if they: improve local livelihoods (CARE/IIED, CBD, UNEP, WCS, WB); improve awareness or understanding of and engagement on ecosystems or ecosystems-services and climate change (CATIE and partners, TNC, UNEP, WCS); and/or enhance the ability of natural systems to resist incremental and/or sudden climatic shifts (all). At least half (four) of the guidelines (CATIE, UNEP, WCS, WB) highlight the significance of the interconnectivity of adaptation efforts at various scales, from local interventions through sectoral and national policies and regional programs and/or frameworks. All of these resources address the possible or probable co-benefits of an EbA approach through the premise that reductions in threats to conservation and/or biodiversity is complementary to or enhances the existing capacity of human systems and ecosystems or ecosystems-services to adjust to climatic changes (even if the longer-term environmental or economic benefits are not immediately apparent). The role of ownership of and participation in adaptation activities, and awareness of climate change among stakeholder groups, are also prominent across each of these guidelines and reports as a key component to building local and institutional capacity around climate change and EbA.

Half of the guidelines and reports (CATIE, GISP, TNC, WCS) described in Table 1 interpret the effectiveness of chosen adaptation strategies at least partially through the lens of *resilience*, and half (CARE/IIED, CATIE, CBD, WCS)—not mutually exclusive from the first half—interpret effectiveness through the lens of *vulnerability*. Resilience is the ability to resist change or bounce back from climatic stimuli without shifting to an alternative system state; and vulnerability is the degree to which an entity or system is affected by climatic stimuli as a function of exposure, sensitivity, and adaptive capacity (Glossary summarizes key terminology). These two concepts are a way of looking at the same intervention from different perspectives in order to provide different entry points for using EbA, and/or defining objectives and targets. A vulnerability approach, for example, might be useful for helping incorporate social and development objectives and indicators into adaptation measures that have a relatively strong focus on conservation and/or biodiversity. On the other hand, using a resilience perspective might be beneficial to designing an intervention that needs to incorporate short and medium term climate shocks into development objectives. Table 2 below summarizes some of the characteristics or implications for framing an EbA approach around these two respective perspectives, and explores the pros and cons of using them to evaluate the effectiveness of EbA.

Table 2. EbA Objectives based on Resilience or Vulnerability[35]

Perspective	Implications for framing M&E	Is compatible with EbA M&E because…	Presents challenges to EbA M&E because…
Vulnerability-based Objectives	Assumes exposure, sensitivity and adaptive capacity are assessable.	• Methods complement participatory and socio-economically based approaches • Progress towards reductions in expected exposures or sensitivities and associated climate impacts can be quantified • Impact models and other techniques can simulate whether targets are met	• Risks mistakenly measuring progress towards reducing 'false' vulnerability (counting neutral or maladaptive changes as successes) • Adaptive capacity may be inherently under-addressed by an intervention designed for biodiversity conservation
Resilience-based Objectives	Assumes adaptive capacity is assessable, but exposure and sensitivity are generally not.	• Attempts to capture the long-term, systems-aspects of ecosystems • Focus on measuring learning, innovation, adaptability of governance and other adaptive capacity aspects	• Difficult to formulate clear, focused objectives around complex concepts of connectivity, diversity, redundancy • Events or shocks that test resilience may not occur in the project timeframe; and/or may require the testing of sensitivity of adaptation options across a wider (or 'plausible') range of climate change projections'

WHAT ARE THE UNIQUE CHALLENGES AND/OR OPPORTUNITIES POSED BY M&E OF EBA, IF ANY, AND WHAT ARE THE IMPLICATIONS OF THESE FINDINGS FOR M&E OF ADAPTATION EFFORTS MORE BROADLY?

As evidenced by the discussion above in Section 2.a., one of the first steps to developing an M&E system is to establish clear objectives. For EbA, clear objectives may include those that address key factors to improving an ecosystem or ecosystem-service(s) judged (through scientific evidence and local knowledge) to have particular relevance to reducing a vulnerable population's exposure or sensitivity to climate change, or in bolstering their adaptive capacity. However, some of the barriers associated with monitoring and evaluating the effectiveness of adaptation strategies relate to setting appropriate and realistic objectives in a context of often unpredictable climate change and climate variability, uncertain distributions of potential losses, and unknown trade-offs between one adaptation strategy and another over long periods of time. Also, even when objectives are clear, the practice of tracking and reporting results against a chosen adaptation strategy can be demanding for several other practical reasons, such as gaps in climate data and climate-relevant information for local decision-making, and insufficient resources to implement robust M&E systems. Table 3 below summarizes many common principles of good practice in adaptation and some of the needs this generates for the practice of each principle in forming and managing M&E systems that effectively capture the results of EbA strategies.

Table 3. Principles of Good Practice and EbA

Principle of Good Practice for Adaptation[36]	Using the Principle in Practice	Needs for Applying to EbA M&E Systems
Use a multi-sectoral approach	Engage appropriate government authorities, community members, and local leadership to identify and address the relationships and trade-offs between traditional sector policies and practices in light of climate change.	Enable collaboration and coordination across appropriate actors in order to capitalize on cross-sectoral opportunities presented by ecosystem-based approaches.
Address the most vulnerable populations	Give adequate support to vulnerability and/or risk assessments that help identify and prioritize actions for groups with the highest levels of vulnerability.	Understand factors that enable local populations, institutions and ecosystems to be resilient to climate variability, and/or expected change, and ensure benefits to those disproportionately affected.
Address multiple geographic scales/link scales	Meaningfully link findings and lessons learned from community through local and national governance structures and policies.	Understand and utilize inter-scalar relationships between local strategies and broader benefits of ecosystems services.
Focus on context	Manage the inapplicability of one set of indicators in all contexts. Distinguish underlying (adaptation deficit) and climate-relevant (adaptation gap) drivers of vulnerability.	Examine and account for multiple stressors on human and natural systems, and the relationship between them, in order to identify appropriate priorities and actions.
Support Systems-thinking	Capture key indicators of dynamic and complex processes in a practical and equitable manner.	Demonstrate nature-based solutions with consideration of provision of multiples services from ecosystems. Support stewardship and locally appropriate, integrated natural resource management.
Support Long-term thinking	Capture changes during implementation that reflect longer-term potential for impacts. Encourage and support continued monitoring, impact analysis, and integrated risk management beyond project timeframe.	Address key biological, ecosystems, and institutional change (in theory if not in practice) relative to long-term climate change. Track key outputs/activities.
Exhibit Flexibility/ Adaptive management	Acknowledge shifting priorities and account for new information to enable adaptive management at appropriate levels of action.	Operate under imperfect information and uncertainty about ecosystems and/or ecosystem services in light of current or potential climatic changes. Devolve management to the lowest possible level of responsibility.
Use best available information	Overcome data shortcomings with local observation, modeling, and/or developing institutional /academic partnerships.	Rely on demonstrated results where possible. Acknowledge uneven distribution in benefits and unintended consequences of choosing one strategy over another.
Support 'learning by doing'	Promote willingness to accept 'failure' as part of the learning process, and communicate learning as a measure of accountability.	Demonstrate transparency and engage local communities and partners to generate, share, and disseminate knowledge on nature-based solutions.

Principle of Good Practice for Adaptation[36]	Using the Principle in Practice	Needs for Applying to EbA M&E Systems
Avoid negative trade-offs, mal-adaptation	Encourage robust understanding of inherent trade-offs in adaptation options. Build on community/ indigenous knowledge and evaluative evidence.	Utilize lessons from previous or parallel adaptive actions in similar contexts. Formulate options and make decisions around best available information.
Ensure ownership and transparency of activities	Establish processes that lead to salient, legitimate, and credible[37] measures of effectiveness and sustainability.	Devise culturally and socially appropriate options for communication. Incentivize participation, openness, accessibility, and collaboration.
Integrate gender	Disaggregate data by gender and encourage measures toward gender equity. Raise awareness of the nexus between gender and climate change.	Incorporate factors of gender (in)equities into adaptation options. Understand and reflect relationships between gender and NRM and/or ecosystems services.
Identify and monitor baselines	Plan for and support comprehensive baseline analysis, drawing on existing research, data or studies where possible. Establish mechanisms to monitor moving baselines.	Examine anticipated ecological shifts in light of climate projections without the intervention. Plan around mismatched timing for monitoring of various natural systems and human systems.

In examining Table 3 above, supporting the principles of good practice for adaptation requires means and methods for assessing long-term, dynamic systems, using flexible and locally-owned management structures. These principles are reflected in the specific criteria that might be used to formulate M&E systems for EbA approaches. For example, because changes in ecosystems are inherently complex and long-term, determining "effectiveness" criteria of a particular EbA project is a practical example of the challenges faced by practitioners more broadly in identifying and measuring the successes of adaptation globally. Another example is that the planning and execution of EbA approaches are inherently highly context-specific, more so than an infrastructural solution, for example; therefore the M&E system must be able to capture the specific (un)desirable local changes while also feeding into reporting on high-level objectives within sectors, regions and/or countries. Also, EbA approaches, as with adaptation more broadly, especially require M&E of outputs (products and services funded) and outcomes (results of those products and services) as well as M&E of processes and the quality of processes (decision-making processes, how information is gathered and used, etc.). Adaptation effectiveness is not only *what* was achieved, but also whether *how* it was achieved reflects current and future needs to continue formulating, testing, and implementing successful adaptation efforts. The practice of M&E specifically for EbA approaches therefore contains valuable lessons to address the challenges of M&E for adaptation more broadly.

Once EbA strategies have been chosen and potential objectives identified, there are several M&E tools or approaches a practitioner or planner might utilize to track and record results to periodically assess implementation effectiveness. Table 4 considers more closely how several possible M&E planning tools and approaches may be compatible and/or incompatible to fulfilling the principles of effective EbA approaches. The table outlines the key characteristics of the M&E tool or method, with references to further information, and points to some potential reasons why the tool or method may or may not be readily applied to EbA approaches.

Table 4. Compatibility of M&E Tools with Principles of EbA

M&E Planning Tool/ Method	Key Characteristics	Compatible with principles of EbA	Incompatible with principles of EbA
Outcome mapping[38]	• Focuses on the behavior of boundary partners, or groups of stakeholders influencing or influenced by the project • Collectively maps out desired changes	• Participatory and inclusive decision-making processes • Looks beyond outputs to outcomes/long-term changes • Captures both processes and results • Complements rigorous scientific analysis of adaptation options	• May not capture the specific links between particular ecosystems and human exposure, sensitivity • May require parallel monitoring systems to capture technical and non-technical components • Is likely to still require other M&E tools to meet reporting requirements
Impact and Response Matrix[39]	• Outlines expected impacts from climatic changes (negative and positive), and chosen response to these impacts • Illustrates which pilot or project activities address which expected climate impacts	• Simple and straightforward for communication purposes • Utilizes (best available) scientific evidence as a basis for decision-making • Can account for a variety of possible climate 'impact'/effect categories	• Is likely to still require other M&E tools to meet reporting requirements • May be difficult to integrate ecosystems if not already part of initial planning strategies
Conceptual modeling[40]	• Sets out scope, conservation target, direct threats, contributing factors, strategies, goals, and objectives • Sets the stage for an intervention in the scope of a specific natural system	• Could be used to complement ecosystems-service mapping, results chains, and other M&E tools • Can be used as a communication tool for a broad set of stakeholders	• May prove difficult to identify a core set of indicators for ecosystems • Cannot apply easily to climate hazards and shocks in the system unless regularly revisited • May require additional M&E tools/methods to meet reporting requirements
Theory of Change[41]	• Illustrates project components and inter-linkages between them required to meet short, medium and long-term objectives • Identifies key assumptions about underlying conditions	• Offers a process-oriented approach to complement result-oriented scientific evidence • Supports planners in taking a holistic and long-term perspective to interventions and their strategies • Illustrates both expected processes and results	• Difficult to account for moving baselines unless theory of change is regularly revisited • May require additional tools/methods to meet reporting requirements • Quality of understanding links between ecosystems, climate change and human well-being depends on expertise and

M&E Planning Tool/ Method	Key Characteristics	Compatible with principles of EbA	Incompatible with principles of EbA
		• Can be used as a communication tool for a broad set of stakeholders • Illustrates contributions to development impacts beyond the reach or the life of the project • Helps planners identify and test the relevance of indicators	information available
Performance Measurement Framework (PMF)[42]	• Outlines expected outputs, outcomes and impact indicators; baseline; targets; data sources; *methods and frequency of collection; responsibilities*	• Encourages planners to set clear objectives and targets and the methods and responsibilities to reach them • Can complement several other M&E tools/approaches (such as outcome mapping, theory of change) and integrate various sources of information • Commonly used for reporting and accountability requirements	• Does not necessarily capture dynamic and complex systems—such as ecosystems—accurately or adequately, unless frequently revisited • Relies on good quality information in design stages; may be difficult to integrate new information
Logical Framework (Logframe)[43]	• Outlines expected outputs, outcomes, and impact indictors; baseline values; data sources; *milestones; assumptions*	• Encourages planners to set clear objectives and milestones toward targets, and coinciding assumptions behind the logic model/results chain • Can complement several other M&E tools/approaches (such as outcome mapping, theory of change) and integrate various sources of information • Commonly used for reporting and accountability requirements, can be used for learning purposes	• Does not necessarily capture dynamic and complex systems—such as ecosystems—accurately or adequately • Relies on good quality information in design stages; may be difficult to integrate new information
Scenario planning[44]	• Represents possible future scenarios in the target region/system • Can represent likely future climatic effects and/or vulnerabilities (in the absence of an intervention), or	• Enables planners to account for multiple possible conditions under which (or sequences in which) the project may be implemented • Able to incorporate as much or as little climatic data, from	• Requires time and resources to consider multiple possible sequences of project implementation and likely climatic scenarios • May still require additional M&E tools/methods to meet

M&E Planning Tool/ Method	Key Characteristics	Compatible with principles of EbA	Incompatible with principles of EbA
	possible adaptation outcomes/project impacts under specific climate conditions/ expectations	various sources, as the planner chooses • Complementary to existing conservation and ecosystems planning tool (Climate-Wizard, EcoMetrix)	reporting requirements
Indexed scale/ Ranking[45]	• Outlines range of all possible outcomes of one or more indicators in the design phase (normalizes or standardizes possible results) • Provides subjective rankings/ scores for (un) desirable change, (such as level of vulnerability), or objective ranges of changes (water table level), there by forming the basis of targets	• Encourages planners to think through and identify all possible outcomes during design stages • Focuses activities on achieving results tied to a range of changes in each parameter of measurement (indicators, objectives) • Compatible with various sources of technical and non-technical information, qualitative and quantitative	• May not be useful for capturing results and lessons learned outside of factors considered in the design phases • Does not necessarily capture dynamic and complex systems—such as ecosystems—accurately or adequately, unless frequently revisited • Relies on good quality information in design stages; may be difficult to integrate new information

While these M&E planning tools and methods listed in Table 4 provide options for capturing both the context of an intervention and the changes it may bring about, it is often difficult to account for or measure changes in exposure, sensitivity, and/or adaptive capacity, specifically, each of which may have aspects that require supplemental studies or information to understand, or additional time beyond project closing in order for changes to become observable. A vulnerability assessment can be used to identify priorities for the project to address, and identify factors to avoid that may induce mal-adaptation or other unintended consequences, but choosing the most appropriate indicators to capture (positive or negative) change in the short, medium and long-term can be challenging in the planning stages. Three possibilities around these challenges are to: use "proxy indicators;" track indicators that will be relevant to an impact evaluation at a later date; and/or ensure through partnerships and local cooperation that there are incentives to monitor conditions and/or indicators beyond the life of the project that provide a useful basis for decision-making and/or governance.

A "proxy" indicator is a substitute for a change that is not directly measurable. For example, improved resilience of natural systems and coastal communities to the effects of storm surges is not readily apparent for several years if the adaptation strategy relies on the restoration of mangroves, taking many years to reach maturity. However, a proxy indicator could reflect short and medium term changes that show the likelihood of the mangroves' success in the long run;; for example, the passing of government policies and/or specific community driven land ownership and use agreements to support this strategy. Another possibility for dealing with tracking long-term change is to ensure the monitoring of indicators (and their surrounding circumstances) in order to conduct an impact evaluation atat a later date. If a funder and/or implementing agency have the resources to conduct an impact evaluation, they will require robust monitoring data in order to compare near term and long-term results. The evaluation will be able to assess the relative contribution of the project toward the intended impact, if present. Finally, in dealing with long time frames, the project may choose to help "prove" contribution to impacts in subsequent years by incentivizing partners such as government or other local groups/NGOs to track project (or project-relevant) indicators in a manner in which the information could later be accessed and used by interested parties. National climate change and development policies are often designed with indicators to measure changes in forestry, water resources, human health, and terrestrial biodiversity, for example, each of which may be directly or indirectly influenced by an EbA initiative. Therefore, encouraging close collaboration with government and key local partners, and providing incentives or resources to ensure the collection of robust data, can help expand the quality and number of options to later assess initiatives respective contributions toward adaptation, conservation, and development.

It may also be difficult to choose indictors that capture different kinds of climatic changes throughout and beyond the project timeframe. Table 5 outlines some considerations for tracking exposure based on incremental changes, climate hazards/extreme events and other forms of variability. Incremental changes mean those that reflect a particular pace of increase or decrease, such as annual reduced rainfall, rising sea levels, or increasing temperature. Climate hazards include hurricanes, floods and other sudden and potentially disastrous events. "Other" forms of climatic variability could be seasonal shifts, for example, around key agricultural activities such as the rainy season, or timing of planting, seeding or harvesting. The 'target unit' in the table is the physical unit that the project intends to influence or affect, followed by exposure examples and possible M&E tools/methods from Table 4 to capture these changes in exposure.

Table 5. Assessing Exposure over Time

Type of Exposure	Example Target Unit	Exposure Examples	Possible M&E tools to capture changes in exposure
Incremental change	• River Basin • Community	• Agriculture: Salinization • Coast: Sea level rise	• Theory of change, logframe, performance measurement framework, outcome mapping
Climate Hazards	• Community • Watershed	• Coast: Storm/hurricane • River: Flood	• Impact response matrix, scenario planning, conceptual modeling, outcome mapping
Other forms of variability	• Region/district • Household	• Agriculture: Unpredictable rain • Health: Disease, parasites	• Index scale, outcome mapping, scenario planning

Initial Planning for M&E of Two Example of EBA Projects

Most EbA initiatives have only just begun to be formally identified and funded as such. Therefore, most initiatives are in the early stages of developing and using their M&E systems, and are in the process of considering a multitude of methods, perspectives and types of indicators to track their progress and learning. Some examples of cross-cutting common ground worth exploring when designing objectives and appropriate M&E systems for EbA approaches include assessing organizational and/or individual learning and behavioral change[46] (such as shifts in agricultural practices of households based on the use of new information or new observations); determining whether scientific information has been taken up into decision-making[47] (such as whether climate data provided to a community through a project has been integrated into their conservation and adaptation planning), and; determining whether the functions or functionality of human and/or natural systems[48] has improved in light of current or expected climatic changes (such as enhancement of regulating or provisioning ecosystem services that have been degraded by previous climatic variability or events).

This section briefly explores the respective processes and options for developing M&E plans for two different Africa Biodiversity Collaborative Group (ABCG) partner projects[49] described in Table 6 below.

Table 6. Case Study Projects

	Initiative/Title	Funding Partner	Implementer	Site/location
1	Ecosystem-based Adaptation in marine, terrestrial and coastal regions as a means of improving livelihoods and conserving biodiversity in the face of climate change	International Climate Initiative (ICI), German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)	Conservation International (CI)	(Northern) Philippines; South Africa; Brazil
2	Climate Change in Western Tanzania: Helping People and Nature Adapt to Climate Change	United States Agency for International Development (USAID), the Jane Goodall Institute, the LifeWeb Initiative of the Ministry for Foreign Affairs of Finland, and the Frankfurt Zoological Society	The Nature Conservancy (TNC)	(Western) Tanzania

CONSIDERATIONS FOR DESIGNING AN M&E SYSTEM

1. The objective of Conservation International's 'ICI' project is the "Demonstration of Ecosystem-based Adaptation assessment, implementation and monitoring techniques that can inform growth in

application of EbA worldwide." The project is implemented across three countries: Brazil, the Philippines and South Africa. This section briefly discusses the Philippines component. Its two pilots, to 'enhance coastal protection' and to 'strengthen fisheries resilience,' respectively, are based on a vulnerability assessment conducted by CI and partners in 2009, which identified the anticipated impacts of climate change on the people and biodiversity of the region and the immediate actions required to adapt to those changes. The target beneficiaries of the two projects are:

- Local fishing communities;
- Coastal communities left exposed by degraded mangroves;
- Community resource management groups such as Bantay Dagat (Sea Wardens) and enforcement agencies (e.g., Philippine Coast Guard); and
- Local Government units, regional provincial governments, government line agencies (Department of Environment and Natural Resources—Protected Areas and Wildlife Bureau, Department of Agriculture-Bureau of Fisheries and Aquatic Resources).

The project starts by asking what ecosystems can do (e.g. services provided) to enable adaptation of the (relevant) target beneficiaries and then, adding the layers of information on vulnerability (exposure, sensitivity, adaptive capacity), determine which ecosystems to address according to their relative contribution or role in enabling adaptation. Developing a Theory of Change for each EbA intervention is a key task in order to demonstrate the hypothesized link between each activity carried out under an intervention (e.g. mangrove planting), and the overall adaptation goal of the intervention (e.g. reduced vulnerability of coastal communities to the impacts of tropical cyclones). It also ensures that assumptions are addressed, the evidence-base for each activity evaluated, and indicators and key monitoring points are defined throughout the project. The project is charged with assessing the cost-effectiveness of EbA, as well as quantifying the ability of EbA to contribute to national adaptation responses. Indicators will need to define and measure both changes in "community resilience" (which uses the proxy indicator of income) and changes in "numbers of communities at risk." Since risk is a social construct, there is no singular threshold of acceptable vulnerability for a community, and identifying indicators will mean prioritizing actions and identifying which changes might lead to changes in social vulnerability. In order to capture these results and the interconnected project components, the project team will develop a theory of change than can be used for planning, monitoring and communication purposes.

In order to account for changes across distinct measures of effectiveness before and after the intervention, the Philippines ICI M&E system treats social vulnerability to climate change as a function of exposure, sensitivity, and adaptive capacity of local populations and institutions. The methodology for defining each of these components of assessment is derived from 'SocMon', "Socio-economic Monitoring Guidelines for Coastal Managers in Southeast Asia," a collaborative report that resulted from two different projects in the region.[50] The answers to a set of standard questions under each of the four components of vulnerability are put into a normalized scale (0 to 1). Across all four components, the changes in local communities can therefore be measured by comparing the answers and observations monitored for this index prior to and after the EbA interventions. Under sensitivity, for example, indicators may include those that measure the dependence on natural resources as a main source of income. Under adaptive capacity, indicators are those that pertain to climate preparedness and livelihoods diversity; whereas institutional capacity indicators might relate to the presence of climate change related programs and legislation to support climate change adaptation.

The information gathered using this method not only examines how each parameter changes over the course of implementation and beyond, but can also illustrate how relevant to adaptive capacity specific actions might be in light of future climatic projections. To date, the ICI Philippines project has data pertaining to the SocMon (Socio-economic Monitoring Guidelines for Coastal Managers in South East Asia) indicators for 5 villages, in 3 of which the project will be conducting activities, and 2 of which can act as controls.

Some of the other unique and/or innovative aspects to the ICI project in the Philippines are that it:

- Utilizes SocMon indicators that link social and ecological systems and are used by governments in the region to collect useful information for improved coastal management, comparative purposes, and collaborative decision-making.
- Supports the development of a standardized vulnerability index and corresponding methodology to monitor and evaluate changes in the levels and types of vulnerability of local communities before and after interventions across a variety of countries and contexts.

2. The objective of The Nature Conservancy's Africa Climate Change Adaptation program in Western Tanzania is to enable stakeholders to understand, predict, and begin to mitigate the projected impacts of climate change on key ecological ecosystems and people's livelihoods in the region planning. The project focuses on increasing the resilience of ecological systems and human communities, with particular attention to freshwater, forest, and public health systems as a critical component of the economic and social fiber of communities living adjacent to Lake Tanganyika. The project seeks to address threats to the well being of people and the environment that result from extreme poverty and a rapidly growing human population, which are exacerbated by the expected significant increases in temperature and aridity across the region. The target beneficiaries include

- Rural agricultural communities
- Managers of land and water systems, including government partners (e.g., Kigoma and Mpanda District Councils, Tanzania National Parks (TANAPA), Tanzania Fisheries Research Institute (TAFIRI) and the Lake Tanganyika Authority)
- Fishing communities along Lake Tanganyika

The project began by conducting an in-depth vulnerability assessment that examined historic and expected future climate change trends based on data from local weather stations from 1951–2010 (historic trends) and downscaled data incorporated into sixteen general circulation models (GCMs) across three climate emissions scenarios (future projections). Climate Wizard[51], a web-based analytical tool, was used to assess the historic and future climate projections for western Tanzania, including temperature, precipitation, and two customized metrics, moisture stress (ratio between water available and demand) and moisture surplus (amount of precipitation that falls in a specific time above the potential evapotranspiration). The Conservancy then worked closely with a multi-stakeholder group (e.g., the Jane Goodall Institute, Frankfurt Zoological Society, Kigoma and Mpanda district officials, TANAPA, etc.) to understand specific potential impacts on ecology and rural production systems, and to help develop ecosystem-based adaptation strategies. Current efforts to design and implement an effective M&E program are focused on measuring uptake of these respective strategies and thereafter assessing the degree to which the strategies reduce the negative impacts of climatic effects, and/or enhance positive outcomes.

Some of the key potential ecological changes that the project will monitor and assess for change relative to planned activities include:

- Terrestrial systems—More frequent and severe droughts, increased erosion of topsoil, changes in vegetative communities, increased spread of fire, disease and invasive species;
- Riverine and wetland systems—Low water levels, increased sedimentation and pollution, changes in amount and timing of water flow;
- Lake Tanganyika: Increased temperatures, increased stratification, increased sedimentation;
- Chimpanzees—Fragmentation of populations due to habitat loss and changes in diet, changes in grouping patterns and increased mortality; and
- Elephants—Drop in population due to increased frequency and length of droughts and shifts in migratory patterns in search of food and water.

The project will also need to monitor for changes in stakeholder awareness of climate change and projected impacts, as well as to what degree conservation strategies incorporate climate change information learned through the project. This will mean continued engagement with stakeholders through additional workshops and other means in order to strengthen regional and national climate policy, develop cost-effective management and adaptation alternatives and build capacity to implement new and additional strategies. This project is unique and/or innovative in part because:

- It is one of the first of its kind to specifically apply EbA in the region. Therefore a core function of the M&E system will be to capture lessons and whether/how those lessons are incorporated into larger scale planning (government strategies, policies etc.).
- Using Climate Wizard enabled detailed analyses that served as the foundation for a series of predictions on climate impacts to key ecosystems and peoples' livelihoods in the region.

NEXT STEPS FOR DESIGNING AN M&E SYSTEM

Finally, there are several challenges to the process and intentions behind developing effective M&E systems for these respective case study projects. Table 7 summarizes several of these remaining needs and indicates to which case study they particularly apply.

Table 7. Challenges and remaining needs for EbA M&E

Challenge/gap	Philippines Project	Tanzania Project	Both Projects
Using indicators/measures of effectiveness that are applicable across multiple countries and EbA interventions	X		
Linking project activities and outcomes to other climate change initiatives in the region	X		
Determining parameters or valuation methods through which to measure cost-effectiveness			X
Accounting for changes in risk adversity and/or risk willingness toward proposed adaptation strategies			X
Operating under concurrent and different times scales for natural and political processes			X
Choosing a manageable number of indicators directly applicable to the target groups/beneficiaries from among many options (M&E guidance is often too high-level and not helpful at the project level)			X
Gaining active and objective input from local partners (who may be hesitant to "push back" in order to gain ownership and enable the learning process)	X		
Requiring an extreme climatic 'event' or a long time-lag to measure significant outcomes			X
Tracking uptake of lessons/information into national policy/policy formulation			X

Lessons and Conclusions

In light of the challenges and approaches to monitoring and evaluating ecosystem-based strategies for adaptation, some of the findings on factors a planner may need to consider in designing effective M&E for an EbA approach, which may also be applicable to M&E of other adaptation approaches, are to:

- Consider the quality and characteristics of the planning context as input to a robust baseline—Consider questions such as: How well have ecosystem services already been considered within the adaptation planning process? What factors are at play that could possibly lead to maladaptation and how have they been addressed in existing efforts?
- Ensure that each indicator addresses a specific driver of climate-relevant vulnerability (whether sensitivity, adaptive capacity, or exposure) identified in the planning stages as being directly tied to ecosystems and/or ecosystems services; consider using existing indicators (from other ongoing efforts such as government surveys or other existing data in specific sectors) that are reliable and available during the project timeframe.
- Consider local capacity as the key to monitoring short-, intermediate- and long-term effects of the project/program, and be realistic about to what degree the M&E system can illustrate the interventions' contribution to adaptation and to longer-term development goals.
- Monitor the context of surrounding activities: Recognize the differences in and relative importance of monitoring for the socio-economic changes, behavioral changes, policy changes alongside the climatic changes, ecological changes, and other bio-physical changes that occur during the project and (have the potential to) influence results.
- Formulate monitoring systems that recognize EbA approaches can be both a *process* (enabling improvements in adaptive capacity—assets, functions, behavioral change, awareness, better policies or strategy options) and an *action* (directly reducing sensitivity and/or exposure to climatic variability, events, and incremental changes), and formulate flexible management and reporting processes to capture both the processes and the results of actions.
- Use a multitude of types of information (scientific, technical, non-technical, qualitative, quantitative, indigenous practices, existing policies) as the basis for defining effectiveness in a particular context.
- Outline what evaluative questions the project's M&E system will be able to answer and at what stages of implementation or how long after implementation ends—e.g. whether about effectiveness[52] (biodiversity, ecosystems-services, livelihoods, etc.), relevance (to national policy, to international agreements, etc.), efficiency (cost per output, scalability, replicability, etc.), sustainability (of project results, local buy-in, etc.), management performance (transparency, communications, decision-making structures, etc.).

Based on these lessons, the following is a summary of key conclusions:

1. Even though the attainment of EbA project objectives may not be immediately or readily measurable, M&E tools can be used to determine proxy indicators, assess positive short-term changes, as well as set up monitoring processes that can create awareness around climate change and track substantive results in the long-term.
2. The challenges in measuring and assessing EbA are consistent with the demands made on M&E of adaptation in a broader sense, and the lessons learned from EbA M&E have much to teach the broader practice of M&E in the development and climate change arena.
3. As EbA is an emerging field, learning 'how' and 'when/where' EbA is effective is as important as determining 'what' EbA can accomplish. It is therefore essential to design M&E systems around the kinds of questions that planners, implementing/executing organizations, and local stakeholders each seek to answer with the information an M&E system generates.
4. In order to effectively capture both context and changes brought about by implementation, planners can: use a vulnerability lens to prioritize actions; focus on monitoring changing exposure in the project timeframe; and plan indicators and monitoring systems with an eye to longer run potential impacts (sensitivity, adaptive capacity, development).
5. Bilateral and multilateral funding agencies investing in climate change adaptation programs will need to devote more resources to addressing the long-term monitoring of project interventions and their results (15+ years after closing), including EbA approaches, so that the relative achievements of particular strategies can be better understood, assessed and used to improve subsequent efforts.

References

[1] See, for example the following online learning and resource forums on climate change, adaptation and measuring adaptation effectiveness: http://seachangecop.org/; http://www.adaptationlearning.net/; http://climate-eval.org/; http://weadapt.org/; http://www.africa-adapt.net/; http://www.uneca.org/mecca/index.html. For key international events and negotiations see, also the UNFCCC Nairobi work Program: http://unfccc.int/adaptation/nairobi_work_programme/items/3633.php; Climate-L Events Calendar: http://climate-l.iisd.org/events/.

[2] For example, see IIED 2012 "Tracking Adaptation Measuring Development," WRI/GIZ 2011 "Making Adaptation Count," OECD. 2011. "Monitoring and Tracking Long-Term finance to Support Climate Action," GIZ. 2010. "Climate-proofing for Development," UKCIP. 2011. "AdaptME toolkit: Adaptation Monitoring and Evaluation."

[3] Martin, Shaun. 2011. Ecosystem-based Adaptation: What Does It Really Mean? WWF Climate Prep blog. March 2, 2011. http://www.climateprep.org/2011/03/02/ecosystem-based-adaptation-what-does-it-really-mean/

[4] CBD. 2009. Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report to the Second Ad-Hoc Technical Expert Group on Biodiversity and Climate Change. Montreal, Technical Series No. 41. CBD and UNEP. Secretariat of the Convention on Biological Diversity. 2009.

[5] IUCN 2010. Building Resilience to Climate Change: ecosystem-based adaptation and lessons from the field. Published as a contribution to Ecosystems and Livelihoods Adaptation Network (ELAN). Gland, Switzerland: International Union for Conservation of Nature and Natural Resources. 2010. P 18.; MEA 2005. Ecosystems and Human-Wellbeing. Synthesis Report. Washington DC: Island Press. p vi.

[6] ELAN 2011. Integrating Community and Ecosystem-based Approaches in Climate Change Adaptation Responses. Ecosystems and Livelihoods Adaptation Network. http://www.elanadapt.net

[7] Ecosystem services may be: supporting (nutrient cycle, primary production): provisioning (fuel, food); regulating (flood regulation, climate regulation); or cultural (aesthetic, spiritual). For more information, see the Millennium Ecosystem Assessment, 2005. http://www.maweb.org/en/Synthesis.aspx

[8] Excerpt of list from: IUCN. 2011. Draft Principles and Guidelines for Integrating Ecosystem-Based Approaches to Adaptation in Project and Policy Design: A Discussion Document. Commission on Ecosystems Management, Bird Life International, CARE, CATIE, Conservation International, IDB, CIFOR, WCN, WWF. http://data.iucn.org/dbtw-wpd/edocs/2011-064.pdf; ELAN 2011; Pringle, P. 2011. AdaptME toolkit. Adaptation Monitoring and Evaluation. UKCIP, Oxford, UK: November, 2011. http://www.ukcip.org.uk/wordpress/wp-content/AdaptME/AdaptME.pdf

[9] UNEP. 2012. Ecosystem-Based Adaptation Guidance: Moving from Principles to Practice. DRAFT. Working Document. April 2012.

[10] The Africa Biodiversity Collaborative Group (ABCG) is comprised of seven U.S.-based international conservation non-governmental organizations (NGOs) with field programs in Africa. See: http://abcg.org/

[11] One project is from Conservation International and the second is a Nature Conservancy project.

[12] Jones, et.al. 2012. Harnessing nature to help people adapt to climate change. Nature Climate Change. DOI: 10.1038/NCLIMATE1463. 26, June 2012. http://people.ucsc.edu/~zavaleta/pubs/Jones_NatureClimate_2012.pdf

[13] WOTR. 2012. Biodiversity and Adaptation to Climate Change. Pp-20. Water Organization Trust. ISBN No.978-81-86748-29-9. p 3.

[14] ISDR. 2005. Hyogo Framework for Action—2005-2015. Building the Resilience of Nations and Communities to Disasters. Extract from the final report of the World Conference on Disaster Reduction. (A/CONF.206/6) United Nations. 2005. p 10.

[15] Shakir, Aslam. 2006. Approach for Disaster Risk Reduction and Management (DRRM) in the Maldives. Presented at the South Asia Policy Dialogue on Regional Disaster Risk Reduction, 21-22 August, 2006, Vigyan Bhawan, New Delhi, India.

[16] Devisscher, Tahia. 2010. Ecosystem-based Adaptation in Africa: Rationale, Pathways, and Cost-Estimates. Sectoral Report for the AdaptCost Study. Stockholm Environment Institute (SEI). 2010. April, 2010; UNEP. 2010. The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature—A Synthesis of the Approach, Conclusions and Recommendations of TEEB. http://www.teebweb.org/Portals/25/TEEB%20Synthesis/TEEB_SynthReport_09_2010_online.pdf

[17] WRI. 2008. Ecosystem Services: A Guide for Decision-Makers. World Resources Institute. p 5.

[18] IUCN 2010. Building Resilience to Climate Change: ecosystem-based adaptation and lessons from the field. Published as a contribution to Ecosystems and Livelihoods Adaptation Network (ELAN). Gland, Switzerland: International Union for Conservation of Nature and Natural Resources. 2010. p 99.

[19] ELAN 2011.

[20] IIED 2011. Adapting agriculture with traditional knowledge. IIED Briefing. October 2011. http://pubs.iied.org/pdfs/17111IIED.pdf

[21] CARE/IIED. 2012. Participatory Monitoring, Evaluation, Reflection and Learning for Community-based Adaptation: PMERL ManuaL. A Manual for Local Practitioners. CARE International: June 2012. http://www.careclimatechange.org/files/adaptation/CARE_PMERL_Manual_2012.pdf

[22] Centro Agronómico Tropical de Investigación y Enseñanza (CATIE). 2011. Draft Principles and Guidelines for Integrating Ecosystem-based Approaches to Adaptation in Project and Policy Design: A Discussion Document. Turrialba, Costa Rica: 2011.

[23] Principles of ecosystem-based approaches to adaptation: EBA promotes multisectoral approaches; EBA operates at multiple geographical scales; EBA integrates flexible management structures that enable adaptive management; EBA minimizes trade-offs and maximizes benefits with development and conservation goals to avoid unintended negative social and environmental impacts; EBA is based on the best available science and local knowledge, and should foster knowledge generation and diffusion; EBA is about promoting resilient ecosystems and using nature-based solutions to provide benefits to people, especially the most vulnerable; EBA must be participatory, transparent, accountable, and culturally appropriate, while actively embracing equity and gender issues. (p 8—10)

[24] Vulnerability assessment tool: allows users to define, prioritize, and classify a set of vulnerabilities according to exposure, sensitivity and adaptive capacity. Estimates on the relative severity of the vulnerability and on the estimated frequency of occurrence can also be added (SM Resources Corporation et ál. 2011)

[25] CBD. 2009.

[26] Burgiel, S.W. and A.A. Muir. 2010. Invasive Species, Climate Change and Ecosystem- Based Adaptation: Addressing Multiple Drivers of Global Change. Global Invasive Species Programme (GISP), Washington, DC, US, and Nairobi, Kenya.

[27] The Nature Conservancy. 2010. Climate Change and Conservation: A Primer for Assessing Impacts and Advancing Ecosystem-based Adaptation in The Nature Conservancy. March 2010.

[28] resistance—defending resources against change, often an expensive and short-term option when there are no other alternatives, e.g. endangered species, extreme hazards; resilience—Management actions that propose to improve a species or ecosystem's ability to respond to a climate-change related disturbance and return to a pre-disturbance state; responsive—responsive options are those that help facilitate the transition of ecosystems from current to new conditions (Miller et. al. 2007)

[29] 1. Identify robust and poor conservation investments. 2. Conserve the geophysical stage. 3. Enhance regional connectivity. 4. Sustain ecosystem processes and functions. 5. Take advantage of emerging opportunities (e.g. REDD). (TNC. 2010. p 16.)

[30] UNEP. 2012. Ecosystem-Based Adaptation Guidance: Moving from Principles to Practice. DRAFT. Working Document. April 2012.

[31] Adapted from TNC 2011: Principles of effective EBA—Promote resilient ecosystems, mainstream ecosystem services, support sectoral adaptation, reduce risks and disasters, complement infrastructure, avoid mal-adaptation

[32] Responses: Indicators measuring the implementation of policies or actions to prevent or reduce biodiversity loss; Pressures: Indicators monitoring the extent and intensity of the causes of biodiversity loss that responses aim to address; State: indicators analysing the condition and status of aspects of biodiversity; Benefits: indicators quantifying the benefits that humans derive from biodiversity.

[33] Clarke P and Jupiter S. 2010. Principles and Practice of Ecosystem-Based Management: A Guide for Conservation Practitioners in the Tropical Western Pacific. Wildlife Conservation Society. Suva, Fiji.

[34] World Bank. 2010. Convenient Solutions to an Inconvenient Truth. Washington DC: IBDR/World Bank. 2010.

[35] Adapted from: Chapin, F.S., Kofinas, G (Ed). 2009. Principles of Ecosystem Stewardship—Resilience-Based Natural Resource Management in a Changing for Environmental Conservation.

[36] Principles of good EbA drawn from: Nairobi WP; CI; CATIE; WB; WWF; IUCN; UNEP. Principles of good M&E for adaptation drawn from WRI; IIED; OECD; Pact; UKCIP, CARE.

[37] Cash, D. et. al. 2002. Salience, Credibility, Legitimacy and Boundaries: Linking Research, Assessment and Decision Making. John F. Kennedy School of Government Harvard University Faculty Research Working Papers Series. 'Social Learning Group.' November, 2002, RWP02-046.; Referenced by UNEP/iisd. undated. IEA Training Manual: A training manual in integrated environmental assessment and reporting. Training Module 8: Monitoring, Evaluation and Learning—for improvement and increased impact of the IEA process. http://www.unep.org/ieacp/_res/site/File/iea-training-manual/module-8.pdf

[38] Originally developed by IDRC—See: Earl, Sarah, Fred Carden and Terry Smutylo. 2001. Outcome Mapping: Building Learning and Reflection into Development Programs. International Development Research Centre. http://www.idrc.ca/EN/Resources/Publications/Pages/IDRCBookDetails.aspx?PublicationID=121; See also: http://www.outcomemapping.ca

[39] See, for example: World Bank. 2010. India: Andhra Pradesh Drought Adaptation Initiative. Lessons from Community-based Adaptation Approaches to Strengthen Climate Resilience. South Asia Region. https://openknowledge.worldbank.org/bitstream/handle/10986/2775/645070ESW0whit0APDAI000Final0Report.pdf?sequence=1

[40] See, for example: Margoluis, et. al. 2009. Using conceptual models as a planning and evaluation tool in conservation. Evaluation and Program Planning 32 (2009) 138–147. http://www.fosonline.org/wordpress/wp-content/uploads/2010/06/FOS_2009_Conceptual_Model_EPP.pdf; California Department of Fish and Game. 2007. Developing Conceptual Models to Improve the Biological Monitoring Plan for San Diego's Multiple Species Conservation Program. Prepared by: Department of Biology, San Diego State University. January 2007. nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=6385

[41] See: http://www.theoryofchange.org; See also, example guides: Organizational Research Services (ORS). 2004. Theory of Change: A Practical Tool For Action, Results and Learning. Prepared for the Annie E. Casey Foundation. http://www.aecf.org/upload/publicationfiles/cc2977k440.pdf; UNDP/Hivos. 2011. Theory of Change: A thinking and action approach to navigate in the complexity of social change processes. UNDP Regional Centre for Latin America and the

Caribbean. Hivos—Humanist Institute for Development Cooperation. http://www.hivos.net/Hivos-Knowledge-Programme/News/Theory-of-Change.

[42] See templates from CIDA—http://www.acdi-cida.gc.ca/acdi-cida/ACDI-CIDA.nsf/eng/ANN-923155220-RB9; Agricultural Institute of Canada International Twinning Partnership Program—http://www.aic.ca/international/pdf/Performance_Measurement_Framework.pdf

[43] See guidance from DfiD—http://www.dfid.gov.uk/Documents/publications1/how-to-guid-rev-log-fmwk.pdf; Center for International Development and Training—http://www.nsa.gm/uploads/1/2/0/3/12030125/developing_a_logical_framework_guide_cidt.pdf

[44] See example training from the US National Park Service—http://www.nps.gov/climatechange/docs/JOTR_KAHO_ScenarioPlanningWrkshpSummary.pdf; Victorian Center for Climate Change Adaptation Research—http://www.vcccar.org.au/files/vcccar/Scenario%20policy%20brief%20web%20version%20120711.pdf

[45] For example, see UNDP's vulnerability reduction assessment (VRA) method (2008)—http://www.undp-adaptation.org/projects/websites/docs/CBA_VRA_Guide_Dec_08.pdf; An example of an adaptive capacity index used in Western Australia—http://www.epress.monash.edu.au/ag/ag060016.pdf

[46] See 'developmental evaluation.' E.g. Quinn Patton, Michael. 2010. Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use. New York, NY: Guilford Press.

[47] For example, by examining the 'salience,' 'legitimacy,' 'credibility' and 'boundaries' of how research is linked to assessment and decision-making. See Cash, D. et. al. 2002.

[48] Functions and functionality of human systems might include, for example, the capabilities and preparation of institutions for existing or expected climatic changes. Functions and functionality of natural systems might include, for example, the value of biodiversity and quality of ecosystems services for dealing with existing or expected climatic changes.

[49] Information was graciously provided by the project managers, David Hole (Conservation International) and Elizabeth Gray (The Nature Conservancy).

[50] Hoon V, Sriskanthan G, Townsley P, Cattermoul B, Bunce L, and Pomeroy B 2008. Socioeconomic Monitoring Guidelines for Coastal Managers of South Asia, SocMon South Asia. IUCN/CORDIO.

[51] http://www.climatewizard.org

[52] UNEP. 2012. Suggests using Sparks, et.al. 2012 four areas to consider in selecting biodiversity indicators, which could also apply to ecosystems/services: 1. Responses: Indicators measuring the implementation of policies or actions to prevent or reduce biodiversity loss. 2. Pressures: Indicators monitoring the extent and intensity of the causes of biodiversity loss that responses aim to address. 3. State: indicators analysing the condition and status of aspects of biodiversity. 4. Benefits: indicators quantifying the benefits that humans derive from biodiversity.