

ECOSYSTEM BASED ADAPTATION MONITORING & EVALUATION – INDICATORS

A COMPILATION AND REVIEW OF LITERATURE

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Introduction

Context and Rationale of a Monitoring and Evaluation Framework for Ecosystem-based adaptation

Ecosystem-based Adaptation (EbA) initiatives are predominantly still in their infancy and hence, their monitoring and evaluation (M&E) is crucial not only to assess their effectiveness but also to have a knowledge base on those initiatives which are optimal and can be scaled up (Harley *et al.*, 2008; Rizvi, A. R. 2014; Spearman & Mc Gray, 2011). Such a knowledge base is also useful for stakeholders to measure progress and effectiveness of EbA projects and programmes. Therefore, it is necessary to develop monitoring and evaluation (M&E) frameworks for ecosystem-based adaptation (EbA). In particular, there is a need to develop a set of context and ecosystem specific adaptation criteria and indicators to define, assess and monitor the effectiveness of EbA initiatives (Harley *et al.*, 2008; Rizvi, A. R. 2014). This working paper, based on review of literature, is an attempt by IUCN to fill the knowledge gap and need.

As highlighted by Spearman and McGray (2011), monitoring is a continuous process of keeping track of and reviewing adaptation programmes, projects and activities, their results as well as the context in which they are being implemented. Such tracking and reviewing allows implementers to make adjustments if deviations from objectives, goals or standards are present. Furthermore, monitoring provides information, which can be used to evaluate programmes and projects.

Specifically, M&E processes are crucial in promoting successful adaptation for the following reasons highlighted by Spearman and McGray, 2011 and OECD, 2009:

“M&E helps practitioners gather and share information, enable adaptive management, track underlying assumptions, manage risks and uncertainties, meet transparency and reporting requirements. Above all, in the context of adaptation, it enables practitioners to 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”

Source: Spearman & Dave, 2012:12

1) They provide critical support to the long-term process of learning “what works” in adaptation (Spearman and McGray, 2011).

This means that M&E for EbA and climate change adaptation (CCA) in general, is “learning by *doing*” and a participatory process. It can help to increase understanding of adaptation options and effectiveness as well as ensure delivery of outcomes. The lessons learned through the process can be incorporated into the M&E framework (Harley *et al.*, 2008; Spearman & McGray, 2011).

2) They provide a critical tool to help practitioners manage their work (Spearman and McGray 2011) and for identifying mal-adaptive pathways.

For example, practitioners may use M&E to:

- Assess whether the identified adaptation options were actually put in place and what unexpected problems arose in the implementation process;
 - Adjust adaptation activities based on how successful they are in achieving intended adaptation objectives;
 - Adjust adaptation activities to address, for example unexpected challenges and/or unintended consequences;
 - Assess and compare institutional structures, processes, impacts and results across various interventions on sectors and in different regions;
 - Monitor over the timeframe of a particular adaptation project and/or programme to ensure the effectiveness and long-term sustainability thereof under evolving climate conditions, and
 - Facilitate discussion and shared learning among participants and relevant stakeholders in a particular adaptation initiative as well as across adaptation projects and programmes.
- (Source: Bours, McGinn & Pringle, 2013; OECD, 2009; Spearman & McGray, 2011; Travers *et al.*, 2012).

3) The information generated through M&E processes could contribute to providing suggestions for improving future adaptation planning and design (OECD, 2009).

It is important for M&E processes to: i) reflect thoroughness, ii) be flexible in order to support learning and allow new insights to be integrated, and iii) embrace a broad range of indicators that are applicable across multiple countries and EbA interventions. The close involvement of a wide range of stakeholders, including ecosystem management experts, experts from different fields, and local community members, is critical in the M&E process. Particularly in selecting and developing a set of indicators so as to ensure a broad consensus over any assessment (Harley & van Minnen, 2010; OECD, 2009; Spearman & Dave, 2012; UNDP, 2002).

Designing an M&E system for EbA

The design and implementation of an M&E system for EbA will depend heavily on a practitioner’s point of reference. Their choices and the priorities that inform them will be reflected in the kind of information generated by the M&E system (Spearman & McGray, 2011). Ideally, ***“the M&E system should capture ongoing results through the collection and analysis of data that is timely, reliable, and cost-efficient”*** (AF, 2011).

As highlighted by Spearman and Dave (2012:22), there are a number of factors that should be considered when designing an effective M&E for ecosystem-based adaptation. These factors may also be applicable to M&E of other adaptation approaches, and are as follows (also see Box 1 for GEF Guidelines for EbA):

a) **Establish clear objectives as a first step to developing an M&E system** (Spearman and Dave, 2012). These objectives may address issues such as improving ecosystem function or services, with the added objective of reducing vulnerability of populations to climate change as well as increasing their adaptive capacity. The challenge here however, lies in the fact that appropriate and realistic objectives need to be established in a context of unpredictable climate change and variability and associated impacts as well as unknown trade-offs.

b) **Consider the quality and characteristics of the planning context as input to a robust baseline.** Questions proposed by Spearman and Dave (2012:22) that may be considered here include: i) How well have ecosystem services already been considered within the adaptation planning process? ii) What factors are at play that could possibly lead to mal-adaptation and iii) how have they been addressed in existing efforts?

c) **Design M&E systems that include short, medium and long-term indicators, and operate at the most appropriate scale to assess project effectiveness and any changes in vulnerability** (Spearman and Dave 2012)

d) **Ensure that the selected/developed indicator(s) address a specific driver of climate-relevant vulnerability** (sensitivity, adaptive capacity, or exposure) identified in the planning stages as being directly tied to ecosystems and/or ecosystems services (Spearman and Dave 2012:22).

e) **Remain realistic about to what degree the M&E system can illustrate the interventions' contribution to adaptation and to longer-term development goals.** Spearman & Dave (2012) recommend considering the local capacity as the key to monitoring short, medium and long-term effects of an EbA project/programme. Local communities need to be involved in the monitoring process to enhance efficiency as well as enhance local capacities and learning. Furthermore, M&E systems will need to be designed to cover an adequate time period and operate at the most appropriate scale to assess project/programme effectiveness (Andrade *et al.*, 2011; GEF, 2012).

Box 1 GEF Guidelines for EbA

Develop monitoring and evaluation system that assesses project effectiveness through indicators that measure ecosystem health, provision of ecosystem services to the vulnerable populations and reduction in the level of climate risks.

- a. Include indicators that reflect ecosystem health
- b. Include indicators that can measure ecosystem services delivered to vulnerable populations
- c. Incorporate mechanisms to quantitatively or qualitatively assess vulnerability and resilience of the human communities after adoption of ecosystem-based adaptation measures.
- d. Choose indicators that reflect resilience of all the components of the human environment system and their inter-linkages.
- e. Design monitoring systems that include both short- and long-term indicators, and operate at the most appropriate scale to assess project effectiveness and any changes in vulnerability.
- f. Involve local communities in monitoring to enhance local adaptive capacity and monitoring efficiency
- g. Through a participatory process, regularly monitor, and evaluate the adaptation benefits to communities, and adjust the adaptation actions as necessary.

Source: GEF, 2012

f) **Recognize the differences in and relative importance of monitoring for the changes** in socio-economic aspects, policy, climate, ecological, and other bio-physical changes that occur during the project and could potentially influence the outcome and effectiveness thereof (Spearman and Dave 2012:22).

g) **Use a broad range of information types as the basis for defining effectiveness in a particular context** (i.e. scientific, technical, non-technical, qualitative, quantitative, local/indigenous practices, and existing policies) (Spearman and Dave 2012:22).

h) **Outline what evaluative questions the project's M&E system will be able to answer and at what stage of the project/programme** (i.e. planning stage, implementation and/or beyond the implementation stage). Such questions may relate to, for example, the effectiveness (in terms of biodiversity, ecosystems-services, livelihoods, etc.); relevance to national policy or to international agreements; efficiency (in terms of cost per output, scalability, replicable, etc.); sustainability, and management performance (i.e. transparency, communications, decision-making structures). (Spearman & Dave, 2012:22).

Figure 1 highlights proposed steps in the development of an M&E system. These steps were identified from various reports in relation to M&E frameworks of an adaptation intervention (i.e. AFB, 2009; OECD, 2009; Spearman & Dave, 2012; Spearman & McGray, 2011; Travers *et al.*, 2012) as well as the considerations outlined above.

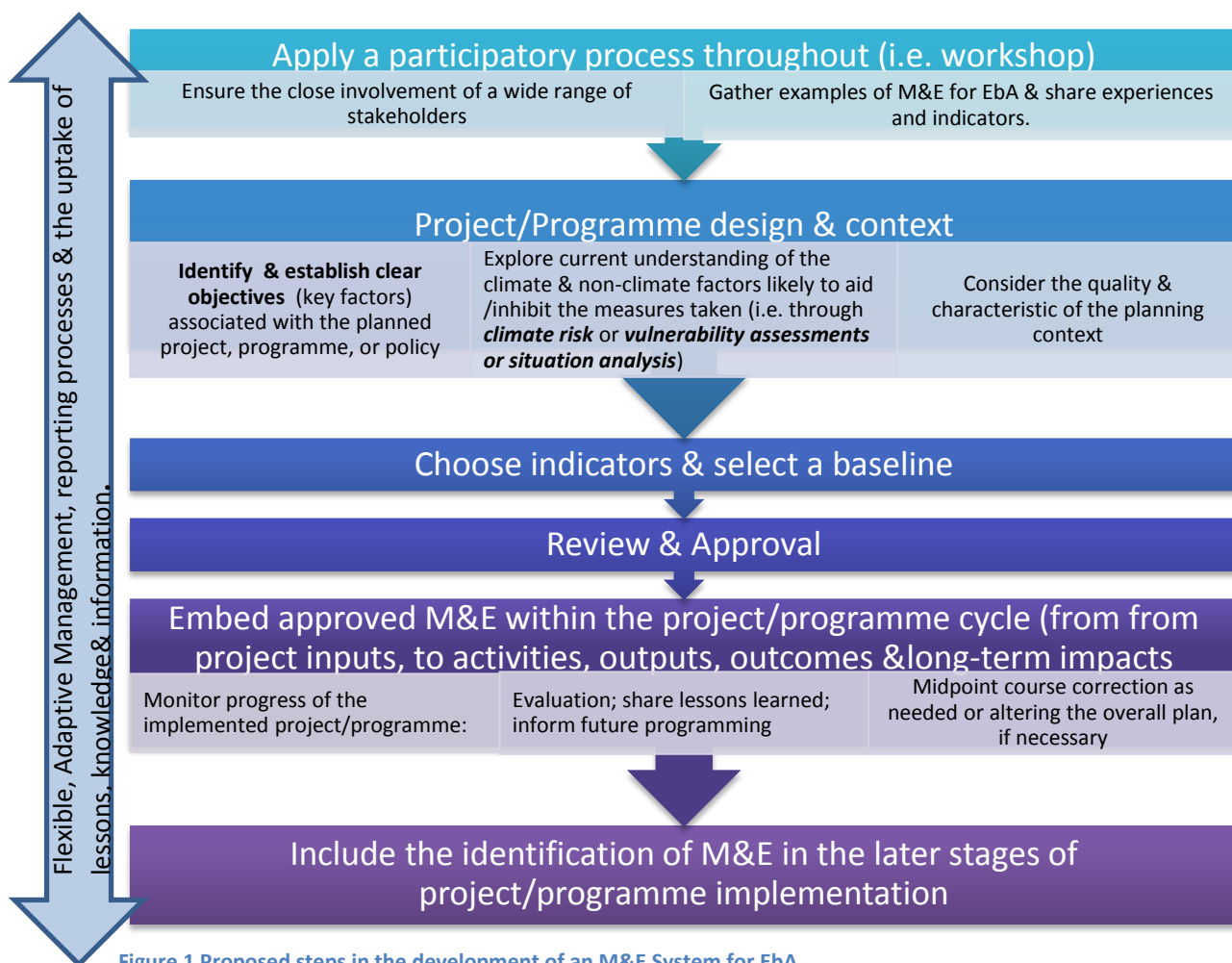


Figure 1 Proposed steps in the development of an M&E System for EbA

What are EbA Indicators?

An indicator (refer to Box 2) is a tool to demonstrate change in a particular situation, enable performance assessment and measure the results and achievements of adaptation-specific activities, projects or programmes. In addition, indicators also assist in producing results by providing a reference point for monitoring, decision-making, stakeholder consultations and evaluation (OECD, 2009; Traverse *et al.*, 2012).

Specifically, indicators are useful tools to (taken from: UNDP, 2002; Harley & van Minnen, 2010):

- Target, justify and monitor adaptation funding and initiatives;
- Measure progress and achievements;
- Clarify consistency between activities, outputs, outcomes and goals;
- Compare adaptation achievements across regions or countries;
- Evaluate adaptation policy interventions;

Box 2

What Are Indicators?

“Indicators are quantitative or qualitative statements or measured parameters that can be used to describe existing situations and measure changes or trends over time. Indicators simplify complex phenomena so that communication of information is enabled or enhanced.”

“They are powerful tools to support effectiveness throughout the processes of planning, implementation, monitoring, reporting and evaluation.”

Source: Travers *et al.*, 2012 & UNDP.

- Ensure legitimacy and accountability to all stakeholders by demonstrating progress and effectiveness;
- Inform future adaptation development;
- Raise awareness and communicate adaptation to policy and decision-makers as well as the general public, and
- Inform political climate change adaptation negotiations in the international arena.

A diverse range of adaptation indicators support various monitoring and evaluation purposes. Examples of identified categories of adaptation related indicators are presented in Box 2. Based on the context of a project and the reason for the M&E process, sets of indicators may be necessary (Harley & van Minnen, 2010). According to Johnson et.al, (2013), "***a pre-requisite for ecosystem-based adaptation indicators is that they relate to spatially referenced data and/or policies for a particular region or ecosystem***".

Box 3

Example of categories of adaptation indicators

- **Indicators for the adaptation policy process;**
- **Indicators to monitor the implementation of adaptation initiatives;**
- **Indicators to evaluate the effectiveness and efficiency of adaptation actions** (i.e. measures of changes in vulnerability, adaptive capacity, and /or changes in actual impacts), and
- **Indicators to measure the level of awareness, knowledge and engagement.**

Source: Adapted from Harley *et al.*, 2008 & Meller *et al.*, 2012

In general, there are two types of indicators: ***process-based*** (*input- and output indicators*) and ***performance-based*** (*measuring outcome- and impact*) indicators. A description of process and performance-based indicators is provided in Table 1 below.

Since EbA and climate change adaptation (CCA) in general are a relatively new policy areas, process-based indicators are likely to be of greater importance in the short-term, whereas performance-based indicators will gain prominence in the longer-term (Meller *et al.*, 2012).

Table 1 Description of Process- and Performance-based indicators, including the potential advantages and disadvantages thereof.

Type of indicators		Advantages	Disadvantages
<p>Process-based [Monitoring the development, implementation & progress]</p>	<p><i>Process-based indicators seek to monitor the development and implementation of adaptation approaches. And measure an agreed course of action and track progress towards the desired outcome.</i></p> <ul style="list-style-type: none"> - Input indicators: Measure the quantity, quality, and timeliness of resources provided; - Output indicators (Short-term results): describe and quantify the products (goods and services) produced directly by the implementation of an activity/project/programme. <p>Such indicators are needed to:</p> <ul style="list-style-type: none"> - <u>Inform and justify decisions;</u> - <u>Assist decision-makers and other stakeholders</u> to progress strategically and proactively through the adaptation process. 	<ul style="list-style-type: none"> • Allow stakeholders & sectoral experts to choose the most appropriate adaptation action to meet an outcome. • <u>Flexible approach:</u> can adjust to new information as it becomes available. • Process-based indicators can often apply sufficiently at short time scales. • May support ongoing learning and capacity development. 	<ul style="list-style-type: none"> • Defining a process does not guarantee successful adaptation. • May be difficult to integrate adaptation targets with objectives in other policy areas (because they are different in nature). • Not necessarily sector-specific.
<p>Performance-based [Evaluate the effectiveness]</p>	<p><i>Performance-based indicators measure the effectiveness of adaptation policies, activities, projects and programmes.</i></p> <p>They relate to outcome and impact indicators:</p> <ul style="list-style-type: none"> - Outcome-based indicators are intended to measure and define the <u>Medium-term</u> results and effectiveness of adaptation actions, associated policies and processes. - Impact indicators are used to measure <u>broad-based, long-term changes</u> (<i>directly or indirectly, intended or unintended</i>) brought about by the policy, activity, project or programme. 	<ul style="list-style-type: none"> • May be possible to link adaptation objectives with objectives in other policy areas. • Likely to be sector-specific. 	<ul style="list-style-type: none"> • Defining an outcome does not guarantee successful adaptation. • Risk of being overly prescriptive of adaptation options (specifying sub-optimal options). • the utility of many outcome indicators is limited by the long timeframe within which M&E must measure adaptation outcomes; • May be inflexible and make it difficult to

			introduce new information (though great scope for flexibility in implementing specific actions to achieve outcome).
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Source: The information provided is adapted from: Harley & van Minnen, 2010; Meller *et al.*, 2012 and Spearman & McGray, 2011).

How to select and develop EbA indicators?

Selecting indicators

There are no "best" indicators and all indicators are not applicable in every context. In addition, their nature and focus will depend on the purpose of the M&E system. It is therefore important to select the most relevant indicators for each situation. A participatory approach is essential when selecting and/ or developing indicators for EbA interventions. This requires the involvement of a wide range of stakeholders (GEF, 2012; Harley *et al.*, 2008; Travers *et al.*, 2012).

Figure 2 outlines proposed steps involved in the process of selecting indicators. Several criteria may be used when choosing appropriate indicators in order to maximize resources and promote efficacy (Harley *et al.*, 2008). Ultimately though, as highlighted by the UNDP (2002), the choice of indicators is determined through a **holistic assessment of validity and practicality**.

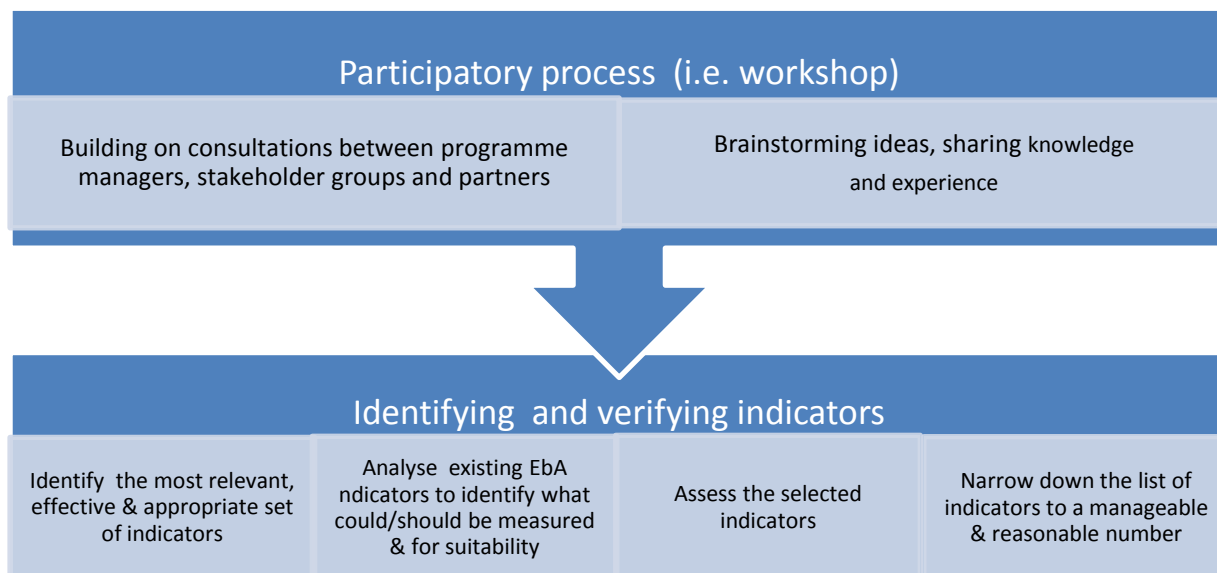


Figure 2 Steps in selecting indicators

Source: Adapted from UNDP, 2002; Fröde-Thierfelder *et al.*, 2013

Drawing on reviewed literature, the following criteria and questions may be helpful in selecting indicators to monitor EbA interventions and evaluate their effectiveness:

Criteria:

- Select indicators that **reflect resilience of all the components of the human-environment system and their inter-linkages**;
- Select **common broad indicators that may be identically measured/monitored within a given region and between regions**;
- Include **indicators that reflect ecosystem health** (i.e. indicators analysing the condition and status of aspects of biodiversity);
- Include **indicators that can measure ecosystem services delivered to vulnerable populations** (i.e. indicators quantifying the benefits that humans derive from ecosystems and their services);
- Incorporate **tools to quantitatively or qualitatively assess vulnerability and resilience of the local human communities after the implementation of EbA initiatives**;
- Selected indicators should **allow reporting at different scales** (national, regional and international) and across different jurisdictions (AF, 2011; Andrade *et al.*, 2011; GEF, 2012).Indicators to measure the implementation of policies or actions to prevent or reduce biodiversity loss (*response indicators*) (Travers *et al.*, 2012).
- A **pre-requisite for ecosystem-based indicators is that they relate to spatially referenced data and/or policies for a particular region or ecosystem** (Johnson, Benn & Ferreira, 2013).
- **Indicators and targets need to be set within a framework that considers changes over time** (Travers *et al.*, 2012).

Questions:

- How will data availability change during the period of implementing the intervention and beyond?
- What existing metrics are available and what data, collected for other purposes, could be applied in the assessment?
- Can local ecological knowledge inform the selection of indicators?

Moreover, it is suggested in literature (i.e. AF, 2011; Césaret *al.*, 2013; GEF, 2012) that Indicators should be set according to the ‘SMART’ criteria as outlined in Table 2 below.

Table 2 SMART criteria for selecting indicators

‘SMART’ criteria	Supportive questions:
Specific to the objective	<ul style="list-style-type: none"> • Is it clear exactly what is being measured? • Does the indicator capture the essence of the desired result? • Does it capture differences across areas and categories of people? • Is the indicator specific enough to measure progress towards the result?
Measurable either quantitatively or qualitatively	<ul style="list-style-type: none"> • Are changes objectively verifiable? • Will the indicator show desirable change? • Is it a reliable and clear measure of results? • Is it sensitive to changes in policies and programmes?

	<ul style="list-style-type: none"> Do stakeholders agree on exactly what to measure?
Attainable (in terms of realistic, practical and simple)	<ul style="list-style-type: none"> What changes are anticipated as a result of the assistance? Are the result(s) realistic? For this, a credible link between outputs, contributions of partnerships and outcome is indispensable Is information available at a reasonable cost and effort? Will it be easy to collect and analyse?
Relevant to the information needs of decision-makers	<ul style="list-style-type: none"> Does the indicator capture the essence of the desired result? Is it relevant to the intended outputs and outcome? Is the indicator plausibly associated with the scope of activity? Will the information be useful for decision-making, accountability, and learning?
Time-bound so that users know when to expect the objective or target to be achieved	<ul style="list-style-type: none"> Is it a consistent measure over time?

Source: AF, 2011; GEF, 2012.

An important aspect to consider is the need to make trade-offs when the optimal indicator is not feasible. Furthermore, at times the numbers of indicators will have to be limited, which may conflict with the need to have a comprehensive set of indicators (AF, 2011).

Examples of EbA relevant indicators are provided in Table 3 on page 10. There are a number of guidance manuals that support the selection of indicators to enable the assessment of EbA initiatives (refer to ANNEX-I).

Developing indicators

There are a number of approaches that can be applied when developing EbA relevant indicators. According to Harley et al. (2008) it is essential that indicators **are applicable, robust, clear, simple and measurable at different spatial and temporal scales**. This implies that long-term goals, and short and medium-term targets must be considered when developing appropriate indicators. The proposed steps outlined in Figure 2 could be followed for developing indicators as well. An important step in the process of developing indicators is to analyse the indicators that are already used in EbA projects/programmes so as to avoid duplicates (Fröde-Thierfelder *et al.*, 2013; Harley *et al.*, 2008).

Box 3 provides a set of key principles, as identified by Harley et al. (2008), Sniffer (2012) and Travers et al. (2012), which are important in the development of a framework for EbA indicators.

Box 4

Key principles for defining EbA indicators

Developed indicators should:

- Sit in the spectrum between vulnerability and resilience;
- Fit within the concept of adaptive management;
- Be set within a framework that considers changes over time;
- Focus on monitoring progress rather than measuring effectiveness;
- Be sectorally distinct;
- Include both process- and performance-based (outcome& impact) indicators;
- Include descriptive reporting alongside quantitative indicators (*to provide context and explanation*);
- Be used to avoid mal-adaptation;
- Be simple and transparent for communication purposes;
- Be dependent upon the purpose of the M&E system;
- Not duplicate pre-existing indicators;
- Provide information that can inform decision-making and the evaluation of proposed and implemented adaptation options.

Source: Adapted from Harley *et al.*, 2008:12; Sniffer, 2012; Travers *et al.*, 2012.

Furthermore, developing indicators requires a **baseline, target** and **timeframe** to be set in order to be useful in verifying the results of a particular EbA intervention. This also makes it possible to demonstrate change over time (UNDP, 2002).

Establishing a baseline

The situation of the site prior to the implementation of a project, programme or policy and agreed upon by all stakeholders, is the baseline and serves as a starting point for monitoring results (UNDP, 2002). According to Travers et al. (2012), in the context of EbA baseline information needs to include climate variability and hazards.

Establishing targets

Establishing quantitative targets that specify potential achievements and are time bound is essential to ensure a desired level of performance (AF, 2011). The key to establishing targets is practicality. Factors to consider in establishing targets include:

- Past trends (i.e. change observed over previous periods);
- How well others have done;
- Limits to progress, and
- The presence of objective international, sectoral or other quality standards. (UNDP, 2002).

The **timeframe** refers to observations taken at specified points in time or within a given period of time (UNDP, 2002).

Examples of Ecosystem-based and climate change adaptation indicators

The Table below provides a number of EbA and CCA indicator examples. These are just a few examples of a wide range of available indicators that are used in EbA projects and more are highlighted in the reports provided in ANNEX-I.

Table 3 Indicator examples

TOPIC AREA/PURPOSE	INDICATOR EXAMPLE (SOURCE)
For monitoring and evaluating changes in ecosystem services	River base flow (UNFCCC, 2013)
	Changes in groundwater & surface water quality (UNFCCC, 2013)
Monitoring/evaluating changes in adaptive capacities and ecosystem resilience	Measuring any improvement in water use efficiency to maintain ecosystem integrity, i.e.: - amount of surface water extracted for irrigation in project sites; - number of monitored wells increasing groundwater efficiency in project sites) (UNFCCC, 2013)
	Measuring improvement in land-use practices and climate change resilience. i.e.: - total hectares of riparian and wetland habitat restored with native vegetation within project sites; - total number of hectares with ecosystem-based approaches (UNFCCC, 2013)
	Measuring the decrease in average rural poverty rate within project area i.e. the targeted watersheds (UNFCCC, 2013).
	Measure increase and diversification of income (UNFCCC, 2013).
	Assess community support for ecosystem-based approaches for adaptation (UNFCCC, 2013)
	Monitoring ongoing governance and legal provisions allocating environmental flows (UNFCCC, 2013)
	Level of climate preparedness (Spearman & Dave, 2012).
Monitoring and/or evaluating institutional capacity	Assess ecosystem services and natural assets maintained or improved under climate change and variability-induced stress (outcome based). e.g.: - Measure changes in hectares (i.e. hectares improved through soil & water conservation methods such as reduced deforestation, improved integrity of ecosystems, reduced erosion and degradation, improved water retention, etc.). - Technical studies by government or specialized agencies, satellite maps, and before-and-after photographic evidence to estimate the area of improved land. - Measure through changes in species population numbers (dynamics, structure, etc.) (AF, 2011:91-92)
	Number & type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets): e.g.: - Number of interventions by type of natural asset and intervention (AF,2011:95).
	Assess the presence of EbA & climate change related programs & legislations to support EbA and climate change adaptation in general (Spearman & Dave, 2012).
Monitoring and/or evaluating institutional capacity	Assess ability to implement strategies and action plan (impact based) (César <i>et al.</i> , 2013).
	Measure quality of planning and implementation of EbA & CCA (impact based) (César <i>et al.</i> , 2013).
	Measure quality of relevant strategies (impact based) (César <i>et</i>

	<p><i>al.</i>,2013).</p> <p>Number & type of targeted institutions with increased capacity to minimize exposure to climate variability risks (impact based) (AF, 2011).</p> <p>Number of people with reduced risk to extreme weather events (impact based) (AF, 2011).</p>
Monitoring changes in sensitivity	<p>Measure the dependence on natural resources as a main source of income (Spearman & Dave, 2012)</p>
Structural flood protection, resettlement, and environment management	<p>Flood control level (OECD, 2009)</p>
	<p>Satisfaction level of relocated persons restored to pre-resettlement levels in terms of income and livelihood (OECD, 2009).</p>
	<p>Percentage of environment management plan monitoring targets achieved (OECD, 2009).</p>
	<p>Warning time against potential floods in project area (OECD, 2009).</p>
Water supply (source: Cabell & Oelofse, 2012)	<p>Number and type of wells installed (output indicator)</p>
	<p>The number and proportion of population with sustained availability of clean water for proper domestic use (outcome indicator)</p>
	<p>Reduction in ill health and mortality (impact based)</p>
Environment (source: Cabell & Oelofse, 2012)	<p>Number of species planted properly and surviving (output indicator)</p>
	<p>New areas reforested and sustainable agricultural practices applied (outcome based)</p>
	<p>Better economic opportunities for local or marginalised communities (outcome based)</p>
	<p>Retention or increase in forest areas (impact based)</p>
Human rights (source: Cabell & Oelofse, 2012)	<p>Number and category of people given training or other types of support (output based)</p>
	<p>More active censure of politicians and law-enforcing agencies(outcome based)</p>
	<p>Greater financial allocation by government to monitor and address human rights abuse (outcome based)</p>
	<p>More transparent, accountable state behaviour (impact based)</p>

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ANNEX-I

Few useful links to a number of resources that can provide guidance in the selection of ecosystem-based adaptation & climate change adaptation indicators:

■ **GRI (2011):**

Approach for reporting on ecosystem services Translates emerging thinking on ecosystem services (ES) into sustainability reporting indicators and approaches that can be used by organizations in all sectors. While focused on organizations, the guide provides a good introduction to ecosystem services and assessment approaches, including criteria for indicator design. <http://www.bipindicators.net/>

■ **UNESCO (2006):**

A Handbook for Measuring the Progress and Outcomes of Integrated Coastal and Ocean Management. Very detailed handbook that presents a range of environmental indicators to monitor the state of the coastal and marine environment, as well as socioeconomic and governance indicators. The indicators are aligned to Integrated Coastal and Ocean Management objectives. In addition, the handbook outlines an approach to test the selected indicators and provides case examples of indicators embedded within a range of evaluation frameworks, for example, logical framework. <https://www.unesdoc.unesco.org/images/0014/001473/147313e.pdf>

■ **CBD (2011):**

Developing Ecosystem Service Indicators. Report that provides a detailed synthesis of the different kinds of ecosystem services categories, and many different kinds of indicators and metrics used to monitor them in recent programmes and initiatives globally. www.cbd.int/doc/publications/cbd-ts-58-en.pdf

■ **The Energy and Biodiversity Initiative (n.d.):**

Biodiversity Indicators for Monitoring Impacts and Conservation Actions. Outlines a methodology for developing site-level indicators to monitor significant positive and negative biodiversity impacts. While the guidance is targeted at oil and gas operators, the approach outlined is applicable for a range of contexts and provides clear guidance on the approach to indicator delineation. This valuable guidance does not present a list of indicators – rather it focuses on the *method* of deriving indicators. This is most appropriate given the context specific nature of ecosystem-based adaptation. <http://www.theebi.org/pdfs/indicators.pdf>

Source: Travers et al., 2012:88-89

■ **Monitoring & evaluation for climate change adaptation: A synthesis of tools, frameworks and approaches** (Bours, McGinn & Pringle, 2013).

This report/guidance manual compiled a comprehensive collection of M&E tools, frameworks, and approaches. With this manual, programme managers, policy-makers, and researchers can identify which materials would be most useful to them. In addition, it identifies gaps and challenges that need to be addressed in the rapidly-evolving field of climate change adaptation

■ **A Review of Monitoring and Evaluation Approaches for Ecosystem-Based Adaptation**(Spearman & Dave, 2012).

This report explores approaches to monitoring and evaluation of EbA strategies. It provides useful information relevant to formulating M&E systems for EbA projects. In addition, it outlines M&E Tools with Principles of EbA.

■ **Review of ecosystem-based indicators and indices on the state of the Regional Seas** (Johnson, Benn & Ferreira, 2013).

This report by the UNEP considers the relevance of a ‘coordinated set’ of indicators capable of comparing common regional marine ecosystem issues. The report collates information on ecosystem-based indicators and indices currently being used by regional entities and seeks to identify common elements.