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Good Practice in Designing and Implementing National Monitoring Systems for Adaptation to Climate Change

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Good Practice in Designing and Implementing National Monitoring Systems for Adaptation to Climate Change

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Abbreviations

ARIA	Institutional Analysis on Adaptation to Climate Change
CICC	Interministerial Commission on Climate Change, Mexico
ENCC-ARG	Indicators of Climate Change with a Socioeconomic Approach – Argentina
ENCC-HND	Indicators of Climate Change with a Socioeconomic Approach – Honduras
GEF	Global Environment Facility
GTZ	Gesellschaft für Technische Zusammenarbeit / German Technical Cooperation
HF	Hailstones/Frost
HRF	Heavy Rainfall and Floods
IACC	Indicators for the Monitoring and Evaluation of the Adaptation to Climate Change
IIED	International Institute for Environment and Development
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
NAC	National Adaptive Capacity framework
NAP	National Adaptation Plan
NAPA	National Adaptation Programmes of Action
NCCAP	National Climate Change Action Plan
NGO	Non-governmental Organisation
NPBMF	National Performance and Benefits Measurement Framework
OVI	Objectively Verifiable Indicator
PACC	Programme of Adaptation to Climate Change
PANCC	National Plan of Action on Climate Change
PCI	Practical Concepts Incorporated
PECC	Special Climate Change Program
PROAGRO	Programme for Agricultural Sustainable Development
PSS	Health Sector Plan for Climate Change Mitigation and Adaptation
RDM	Robust Decision-Making
RBM	Results-Based Management

RISE	Response-Inducing Sustainability Evaluation
RVD	Rainfall Variability and Drought
SERMANAT	Ministry of Environment and Natural Resources, Mexico
SIRE	Regional Environmental Information System
SLR	Sea Level Rise
TAMD	Tracking Adaptation and Measuring Development
UNDP	United Nations Development Programme
UNEG	United Nations Evaluation Group
UNHCR	United Nations High Commissioner for Refugees
USAID	United States Agency for International Development
ZOPP	Zielorientierte Projektplanung / Objective-Oriented Planning

Foreword

Jukka Uosukainen
Director, Climate Technology Centre and Network

The extent and effectiveness of investments made for adapting to a changing climate will have a defining influence on how well countries are able to achieve their development objectives in the near and long term. As the negative impact of climate change intensifies and as investment in climate change adaptation action increases, it is crucial that rigorous systems are put in place for measuring the impacts of climate change and investment impacts over time. Doing so will strengthen the effectiveness of investments, and thereby mitigate the loss of life and livelihoods in the context of climate change.

Thankfully, an increasing number of countries are strengthening their systems for monitoring systems for climate change adaptation. There is a growing wealth of activity in this field. However, perhaps due to contextual diversity and the relative newness of the discipline of measuring and evaluation climate change adaptation, there is a range of approaches and methodologies for doing so. Perhaps as a reflection of this increase in activity and assortment of methods, the Climate Technology Centre and Network (CTCN) is increasingly being requested by developing country authorities to share good practices and provide hands on technical assistance in this field. It is hoped that this publication can be a useful reference for government officials and technical practitioners who are designing systems for measuring and evaluating climate change adaptation.

CTCN is the implementation arm of the UNFCCC's technology mechanism, and is mandated to promote the accelerated transfer of environmentally sound technologies for low carbon and climate resilient development. CTCN is hosted by the United Nations Environment Programme (UNEP), in collaboration with the United Nations Industrial Development Organisation (UNIDO) and 12 independent, leading climate technology organisations located throughout the world. As mandated by the Conference of the Parties, and guided by our Advisory Board, the CTCN provides the following three core services:

i. technical assistance to accelerate the transfer of climate technologies, at the request of developing countries;
ii. strengthening access to information and knowledge on climate technologies; and
iii. fostering collaboration among climate technology developers, users and financiers.

This publication is a product of technical assistance being delivered in Colombia, at the request of their National Designated Entity to CTCN and in close partnership of national stakeholders including the Ministry of Environment and Sustainable Development, the Department of National Planning, the National Unit for Risk Management and the Institute for Hydrology, Meteorology and Environmental Studies, to support the development of the indicators for the national monitoring system for adaptation to climate change.
Finally, it is my pleasure to thank the Government of Colombia for their leadership and innovation in the field of climate change adaptation in general and the effort to develop an indicators system to complement the National Plan for Adaptation to Climate Change. We are also deeply grateful to CTCN Consortium Partners, UNEP-DTU Partnership and CATIE, for their work in this publication and on climate change adaptation technologies more broadly.

Jukka Uosukainen

1. Introduction

Climate change presents a new type of challenge for development. It is, by now, widely acknowledged that climate-change impacts amplify existing unfavorable conditions for developing countries (McCarthy et al. 2001). It is also acknowledged that developing nations are more vulnerable and have less adaptive capacity to confront such changes (Swart et al. 2003). Countries with limited resources, poor infrastructure and unstable institutions have generally little capacity to adapt and are highly vulnerable (Smit and Pilifosova 2001). These factors are intrinsically linked with those that promote sustainable development while at the same time aiming to improve living conditions and increase access to resources. Therefore, targeted development planning and strategies have important roles in strengthening the adaptive capacities of societies at various levels.

Adverse effects of climate change are determined not only by changes to climate, but also by the sensitivity of human and natural systems to these changes. The recognition of the exposure and sensitivity of systems to multiple climate-induced stresses implies that development frameworks will need to consider the links between sustainable development and climate change. Additionally, this will require climate change to be brought into development planning, for which it will be critical to acquire an understanding of what policies will work where and when. Implementing adaptation interventions is incomplete without knowing the progress of the intervention and how it enables the overall goal of building resilience to the changing climate to be reached. The monitoring and evaluation (M&E) of adaptive management practices, in simple words, are processes, tools and techniques that systematically and periodically measure and analyse the processes, outcomes and impacts of adaptation programme activities to achieve the intended objectives. Monitoring is "*the routine collection and analysis of information to track progress against set plans and check compliance to established standards*" (IFRC, 2011). Evaluation, on the other hand, is defined as " *the systematic investigation of the merit*, *worth or significance of an object*" (Scriven, 1999). There is a growing body of literature emphasising the importance of the M&E of adaptation measures. Hence the need to develop relevant tools, mechanisms, frameworks and guidelines for the M&E of adaptation interventions in order to assess the relevance, results, processes and impacts of adaptation.

Monitoring and evaluation systems are ongoing exercises that can applied to a specific measure, a programme, a portfolio or a country. The magnitude of complexity in introducing such systems increase with level, that is, from the level of a single measure to a national level system. The timing and integration of the M&E system is very important. While developing a system of M&E indicators for a specific measure the overall goal of the programme should be kept in mind. For a programme, the M&E system should be well integrated with the planning process, while the indicator system should be in place at the beginning of the programme, since it facilitates the processes and enables comparison. National-level indicator systems for M&E can be complicated as they act as if they have to provide an overall framework for different adaptation policies.

In this report, we identify, analyse and compare international good practices in the design and implementation of national monitoring and evaluating indicator systems for climate change adaptation. This first chapter provides an introduction to the context and key terminology in the domain of climate change adaptation and indicators for M&E of adaptation. The second chapter discusses the existing approaches to M&E, while Chapter 3 provides a general overview of approaches to M&E Frameworks for Climate Change Adaptation. Chapters 4 and 5 outline and discuss the application and relevance of existing frameworks for M&E in international and Latin American contexts.

2. Monitoring and Evaluation of Climate Change Adaptation

The perception of adaptation within the climate change literature is generally that it involves 'adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities' (IPCC 2001, p. 982). Importantly, this definition includes both climate variability and climate change. Failing to integrate adaptation into development planning and policies renders a country's socio-economic systems vulnerable to climate change and can slow down its development initiatives.

The climate change debate has stimulated an increasing interest in measuring and analysing human vulnerability to climate change and potential initiatives to adapt to the negative impacts of these changes (Mertz et al. 2009a; Vincent 2007; Eakin and Luers 2006). Vulnerability to climate change impacts is the degree to which a system is susceptible and unable to cope with the adverse effects of climate change (IPCC 2007; Adger 2006). The key parameters of vulnerability are the stress to which a system is exposed, its sensitivity and its adaptive capacity. Thus, the vulnerability of, for example, a household will determine its ability to respond to and recover from negative climate change impacts. Hence the importance of decreasing vulnerability to climate change further emphasises the need for appropriate adaptation interventions.

Adaptation interventions have now become an integral part of plans and policies to deal with changing climate, but they are often also integrated into general development efforts. However, little evidence exists as yet on the success of these measures in reaching their intended objectives, and/or contributing to development, and/or mitigation efforts. One important step in making adaptation count is to design appropriate monitoring and evaluating mechanisms for adaptation investments that can contribute to evidence-based decision-making in the future. Whether an adaptation measure has produced desirable results or not, or if, the measure is in progress, whether it is on a desirable path or not are issues that can be tackled by M&E processes. In contrast to mitigation investments, each adaptation investment is unique, not easily replicable, often bottom-up, very site-specific and difficult to quantify. While the secondary and tertiary benefits of adaptation may cut across various sectors, the design, implementation and immediate benefits are specific to a location.

There are many reasons why M&E should be incorporated as an integral part of adaptation intervention, some of which are as follows:

- Projections on climate change have a varying level of uncertainty, and adjustments may need to be made as more reliable information becomes available.
- M&E indicators help track the progress of the intervention as well as measure its effectiveness in achieving the desired objective.
- Critical success factors for an adaptation programme can be identified through M&E processes.
- When working within a limited pool of resources, M&E mechanisms can help efficiently allocate resources among various processes to bring about maximum returns. Sometimes efficient utilisation of a critical resource is a key success factor for measuring, in which case M&E mechanisms can be useful in ensuring that the resource utilisation follows the planned path.
- M&E indicators can be helpful in designing a good mix of mitigation and adaptation interventions so that they complement each other in the best possible manner.
- M&E indicators can help identify the target groups and other vulnerable groups, as well as the direct and indirect beneficiaries of the adaptation intervention.

- M&E indicators enable comparison with respect to a baseline for different time periods, as well as comparisons across interventions.
- M&E indicators focussing on the process and intermediate targets help identify unanticipated problems. This means that corrective action is possible while the programme is ongoing, instead of realising that the actual output is far away from the desired output at the end of the programme.
- Adaptation is a continuous process, and often one intervention is followed by the other. Future decisions and policy-planning will be better informed when decisions are based on how well a particular action was executed and produced the desired results. Therefore, the M&E process helps identify the areas that need improvement and those that are doing well, which in turn contributes to the right choice of future interventions and their adjustments and intensities.
- M&E processes can help assess concerns regarding the assumptions underlying an objective and the strategy adopted for meeting it.

The ultimate objective of having a robust M&E process is to increase the success rate of adaptation investments within a given set of limited resources and other constraints like information inputs etc. Measuring and evaluating the impact of an adaptation investment or judging whether an adaptation strategy has been successful or not through appropriate indicators is a challenging task. Some of these challenges are discussed in the following chapters. Whether an adaptation investment is correct, whether it yields the same results and whether it is on the desired process path can only be assessed through M&E.

2.1 Monitoring and Evaluation Processes

M&E are often linked together. However, the two terms deal with different issues at various stages of programme implementation.

- **Monitoring** is an ongoing exercise, sometimes performed at pre-defined time intervals. The focus of monitoring is on activities and processes. 'Monitoring' a process, one looks into compliance with designs and other process specifications, intermediate targets, progress from a reference level or towards a set objective, etc.
- **Evaluation** primarily focusses on outcomes and impacts. It is performed periodically and is often pursued at the end of the programme, but it is becoming increasing common to have ex-ante or mid-term evaluations. Evaluation assesses the causal contribution of adaptation interventions or the activities of the intervention to the actual results. When outcomes are being 'evaluated', the evaluation process checks whether the outcome is in alignment with the goal of the programme, whether the outcome resulted in the change that was expected, etc.

Rephrasing a lesson from sustainability M&E practice (Imbach et al. 1997), it is necessary to differentiate between the assessment of projects and programmes that go through formal planning procedures and assessments, and the assessment of social and natural processes that are not formerly planned. This is a key distinction because the evaluation approach and tools required in each case are different. This publication emphasises the M&E of projects and programmes or of any planned intervention, but as will be seen below, the M&E of processes is important for defining priorities and objectives and for identifying the barriers and limitations that planned activities and programs may have to face.

When an evaluation exercise is carried out before the implementation of the intervention, it is usually a component of the feasibility study looking at the potential outcomes and impacts. Therefore, as a part of the feasibility study, pre-implementation evaluation deals with issues like prospective benefits, flexibility in processes, appropriateness for target community, etc. If evaluation is done at the end of the process, it deals with issues like benefits realised. To put the difference between monitoring and evaluation in simple terms, monitoring assesses what is being done, while evaluation assesses what has been done. Monitoring processes gather information on progress, results or impacts, while evaluation helps in appraising them against certain criteria. Information from monitoring activities is also an input for ex-post and mid-term evaluations. Evaluation highlights the achievements or failures of the intervention as the case may be.

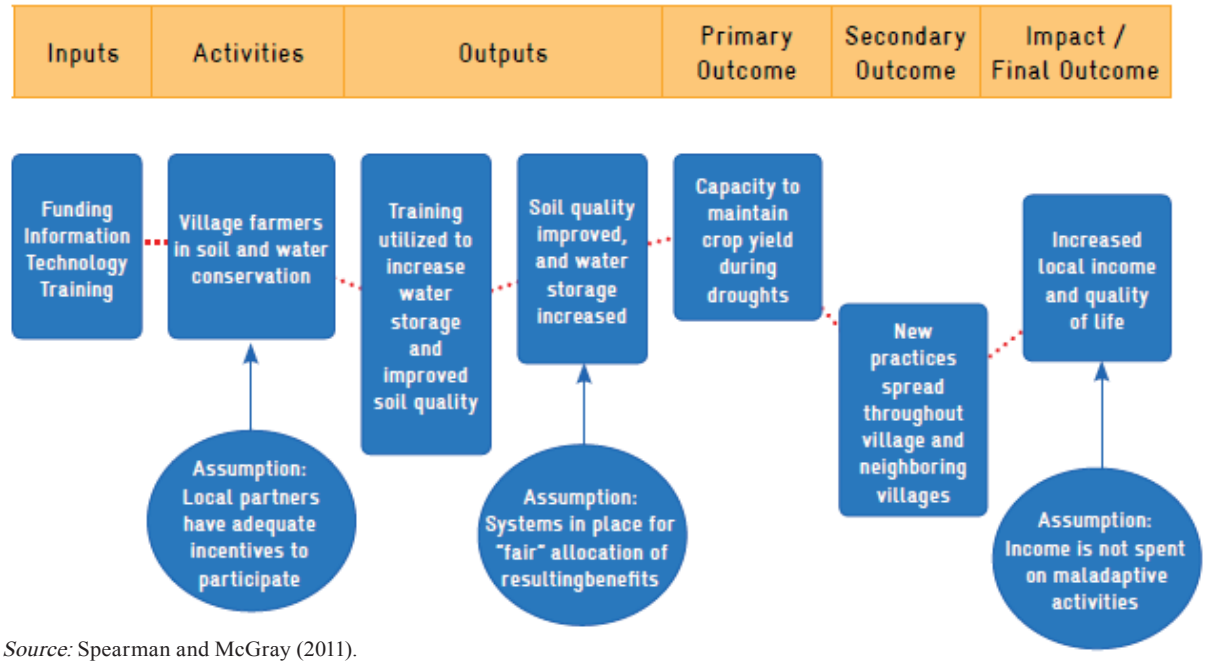
Monitoring checks for the difference between the actual paths followed during implementation and the paths planned in the outline. Evaluation can also explore unintended results, while monitoring can be very useful when resources are limited.

2.2 Stages of M&E Process

The primary concern in implementing an adaptation intervention is that it delivers its intended contribution in an appropriate way that it is beneficial to the target beneficiaries within a defined set of resources: that is, it is effective, has a positive impact and is efficient. In order to achieve these aims, robust M&E systems are needed. An adaptation investment may involve many processes that can have different timelines. In such a case, the overall evaluation will integrate the results of the M&E regarding the processes that comprise the adaptation intervention. In general, the design of an M&E system typically follows the following steps:

1. Setting Objectives. Setting or clarifying the objective of the M&E system is the first step in the process. The objective has to be in alignment with the broader goals of, for example, a national adaptation strategy or programme or a plan of action and be in line with available information on climate change hazards and exposures. Spearman and McGray (2011) emphasise the importance of adaptation objectives being derived from an adaptation context assessment. This implies that the practitioners and evaluators should be well aware of the context of how the intervention benefits and affects the target segment, the non-climate factors involved in the success of the intervention, the beneficiaries etc. It is in this context that the M&E objectives have to be determined. Spearman and McGray (2011) propose three categories of activity and their potential contribution, namely, adaptive capacity, adaptation actions and sustainable development.
2. Adaptation Theory. Establishing an adaptation theory of change implies that the phenomenon involving the implementation of the investment is known. Therefore, the theory concerning the components of the system, the results, spill overs and probability of success are known. The adaptation theory of change sets the basis for attribution (i.e. what part of the achievement of a goal can be attributed to the investment). This adaptation theory links key activities to adaptation outcomes. It also determines the conditions needed to reach the objectives identified by breaking down activities into the different steps needed to reach an objective. This would include outlaying activities, outputs and outcome(s) to reach an identified objective. Typically, this theory of change is illustrated by a table or other visual illustration of expected inputs, outputs, outcome(s) and impacts of the adaptation intervention. An illustration is provided in Figure 1 below.

Figure 1. Example of a theory of change



Source: Spearman and McGray (2011).

3. Choose Indicators. Choosing the indicators depends on the processes that have to be monitored and how accurately the indicators capture the progress of the process. The context, local or national, is also important for the choice of indicators. Choosing indicators entails multiple considerations, including the following:

- ✓ Baseline and Benchmarks. Indicators that measure change necessitate the identification of a baseline against which progress is measured. In the case of multiple processes a baseline scenario has to be developed. Baseline scenarios are useful when the future state is being measured with respect to the current stage. Though monitoring is a continuous process, sometimes measuring progress requires that specific intermediate target points are set. For investments that have standard processes, that is, the processes are well defined and common, benchmarks for monitoring with respect to time period can be set. For example, if a new drought-resistant crop has to be introduced, there will be guidelines that have to be followed in terms of time of planting, time frame and quantities for watering and adding fertilizers etc. These are well defined and standard practices that need compliance for which process indicators can be designed.
- ✓ Prioritisation based on critical resources. When implementing an adaptation investment, it is likely that not all resources will be fully available. Sometimes some resources are critical for the success of the investment, that is, their appropriate use determines the success of the intervention. These critical resources have to be judiciously used and may require a particularly rigorous monitoring mechanism, given that deviations can lead to implementation failure.
- ✓ Measurement tools and resource requirements. The measurement tools, processes and resources required to implement the M&E system will have to be identified at the outset. For example, in measuring increases in farm productivity, the resources required include field investigators, maps and measuring equipment. Resource requirements would define the budget and timeframe of the M&E system. This also helps in selecting the right bundle of indicators that are efficient in terms of M&E resource requirements. Afforestation can be tracked by field investigators as well as through remote sensing, but, based on context, only one of them could be more efficient as well as cost-effective. Identifying tools provides clarity in terms of the processes that will go into executing the M&E system. Sometimes only a representative sample is studied, this choice being dependent on the tool.
- ✓ Data Sources and Assumptions. Data sources have to be identified for measuring baselines, defining benchmarks and measuring indicators. Sometimes the data sources are the beneficiaries of the adaptation intervention. The assumptions define the boundaries for which the indicators hold good and are effective enough to measure what they are expected to measure.

4. Implementation and Execution of the M&E system. The final step in the M&E process is its implementation.
5. Triangulation techniques. Triangulation refers to using more than one method of investing the same thing in order to validate the results of the first method. Often, particularly for evaluation, alternative methods of measurement have to be identified because a single measurement mechanism may be inadequate to evaluate the success of the intervention, or else, due to a high error margin in one method, another method may be used to supplement it. When assessment is made using samples, more than one sample may be taken. For indicators that are tracking critical resources, triangulation methods can be adopted to ensure a tighter monitoring system.
6. Results, Interpretation and Information Dissemination for action. The results and interim and final reports have to be interpreted and communicated to those responsible for implementing the adaptation intervention. This step is an important part of the M&E process, as it helps rectification measures to be taken if the process is not on track.

A comprehensive M&E of adaptation at the national level will require the development of indicators of progress. The nature and focus of such indicators will depend strongly on the objective of the evaluation. In the case of an in-country request to evaluate the success of national adaptation policies and interventions, the M&E will need to use indicators that are logically tied to defined policy goals, which can be used to sketch out progress towards measurable policy targets.

2.3 Process of Selecting Indicators

There are no defined methodologies or guiding principles for selecting indicators for M&E. However, making the right choice of indicators still constitutes a critical step in the M&E process, as the entire purpose of introducing M&E system fails if the choice of indicators is not appropriate. In the previous section we defined what constitutes successful adaptation and how the criteria for M&E processes affect the choice of indicators. In this section we describe SMART, SPICED and CREAM, popular concepts used in the process of indicator selection.

SMART. 'SMART' stands for *Specific*, *Measurable*, *Attainable*, *Relevant* and *Time-bound*. Indicators must be focussed and clearly defined, that is, they should be **specific**. For example, the capital cost of building a water reservoir is USD 10,000, to be spent in ten equal instalments over ten months. This is a specific indicator where every month one tenth of the construction is achieved and one tenth of the payment is made. Whether qualitative or quantitative in nature, there should be a defined method of measuring the indicators in such a way that the method used to **measure** them can be repeated and used for comparison. In other words, the indicators should be objectively verifiable. Maintaining objectivity is a little complicated in case of qualitative variables. The target of the indicator should be **attainable** within the scope of the defined goals of the adaptation intervention. The indicator must also be a valid and appropriate measure of the process, outcome or impact that is being monitored, that is, it should be **relevant**. For example, growth in the production of wheat with respect to the base line is a relevant indicator in measuring the efficiency of a new drought-resistant hybrid seed. Indicators should have a temporal connection, that is, a defined period for their achievement. **Time-bound** indicators must also be trackable. Training 20% of coastal village dwellers in sustainable aquaculture techniques during the period from June to September 2014 is a SMART indicator.

CREAM. Schiavo-Campo (1999) defines CREAM indicators, which should be **clear,** i.e. unambiguous and precise; **relevant,** i.e. should measure the process, outcome or impact appropriately; **economic,** i.e. should justify the costs involved; **adequate,** i.e. should provide enough information or basis for assessment; and **monitorable,** i.e. should be amenable to independent validation (Schiavo-Campo, 1999). CREAM indicators are somewhat similar to SMART indicators and have an overlap for clear/specific and relevance properties.

SPICED. Roche (1999) proposed the SPICED approach, which deals with how indicators should be used: *Subjective*: key informants can contribute by providing insights that can be useful in saving critical resources like time. *Participatory*: indicators should be developed in consultation with stakeholders. Having a participatory approach ensures that different interests are well represented. *Interpreted and Communicable*: contexts for locally defined indicators must be interpreted and communicated to relevant stakeholders. *Cross-checked and Compared*: the validity of indicators should be cross-checked by comparing them with multiple indicators and tracking their progress or by using different stakeholders for the same indictor. *Empowering*: the process should be empowering for stakeholders so that they can reflect critically the changes in state across time periods. *Diverse and Disaggregated*: the indicator set should be diverse in order to capture a range of phenomena, groups, processes etc. Information-recording mechanisms should facilitate the temporal tracking of differences and diversity.

2.4 Criteria for Selecting Appropriate Indicators

Designing indicators for M&E depends on what constitutes a successful adaptation. A climate change adaptation initiative should not be viewed as an outcome in itself: it should merely be seen as an enabler to decrease vulnerability to the adverse impacts of climate change, as well as to reach development goals within economic, social and environmental priority areas. Consequently, indicators for the M&E of adaptation initiatives are not necessarily very different from those for other development and planning initiatives.

Identifying what constitutes successful outcomes of adaptation interventions is a precursor to designing M&E indicators. A discussion paper by Adger et al. (2005) concludes that the criteria with which to measure successful adaptation should include context-specific criteria of efficiency, effectiveness, equity and legitimacy. In general a good indicator set would meet many M&E criteria. The following are some of the criteria which indicators should reflect when they are used for the M&E of adaptation interventions:

a. Relevance. This refers to how well an adaptation intervention meets its overall objectives. For example, if an agricultural strategy is designed to be useful in droughts, it should meet its objective if a drought occurs. The M&E process should subsequently measure the objectives, such as their validity, the overlap between objective and intended impact, the choice of activities etc. In this specific case the indicators might be the ratio of water required per unit area in the base case and the drought case. The choice of indicators should also be based on their relevance to the context, since local contexts can vary considerably even within a country, municipality, etc. Relevance indicators need not be measurable, but can also consist of the qualitative judgements of the investigators. For example, in an ex-ante evaluation of a drought resistant crop, indicators are needed that the crop can bear low soil moisture levels up to a specific level. However, the location where this crop variety is being administered may indicate a much lower soil moisture level. Hence the relevance indicators of the suitability of this crop for the region should reject the use of this crop.
b. Efficiency. This is a measure of outputs with respect to inputs. The efficiency of an adaptation intervention is measured by how much more output is received per unit of input. Usually efficiency indicators are based on costs, person-hours, volume of materials used etc. Indicators based on this criterion are heavily dependent on the baseline assessment.
c. Effectiveness. This is a measure determining how well each intervention achieves its objectives. Indicators of effectiveness typically cover the impact of the intervention.
d. Feasibility. This refers to the overall viability and practical possibility of an adaptation intervention. This is typically an ex-ante criterion. Interventions with ambitious goals will have lower chances of success. Therefore, the implications for the M&E indicators are that they should reflect the feasibility of goals and that the intermediate targets should reflect an operational range. Feasibility can also depend on technological concerns, management capacity etc. The feasibility criteria need not necessarily be a part of the M&E system if, at the outset, the assumptions and risks of the intervention are defined.
e. Equity. Equity criteria consider the extent to which adaptation interventions benefit the vulnerable population. This also has spillover implications that something may be beneficial for one segment but is adversely affecting another segment. For example, if an intervention is designed to benefit coastal communities, the indictors should focus on how well the marginalised sections of the coastal communities have benefitted and assessing whether one segment is being adversely affected at the cost of some other beneficiary.
f. Beneficiaries. This is a criterion for coverage. While equity requires an adaptation intervention to cater to the requirements of marginalised segments, ‘beneficiaries’ criterion focus on the span and

extent of the beneficiaries. This could be in terms of the number of beneficiaries, their geographic span, the number of categories of beneficiaries covered etc. For example, a water conservation technique benefiting 70% of the farmers in an area is an example of a coverage criterion.

g. Flexibility. Flexibility is particularly important for long-term interventions under conditions of climate uncertainty, as the future state of the climate is not known. Therefore, the flexibility to change the intervention in course of the time can be crucial for the success of the intervention. The indicators can therefore check for lock-in periods.

h. Sustainability. In the context of adaptation, sustainability would require an adaptation intervention to be non-maladaptive or not to have negative spillovers, to be compatible with the environment, and to be self-sustaining after an initial push, being in a position to deliver continued benefits even after the project is over (Brooks, et al. 2011). The indicators should be comprehensive enough to address the complex issues surrounding the concept of sustainability.

i. Acceptability. This addresses how stakeholders will respond to the intervention. Some forms of adaptation intervention require beneficiaries or other stakeholders to be actively involved in implementation. If there are social, cultural or legal issues with acceptance, the intervention may not produce the desired results. Therefore, in such cases, the indicators must take into account a stakeholder acceptance factor.

j. Implementation (Compliance). In some adaptation interventions, compliance with standard operating practices is crucial for success. In such cases process indicators with intermediate targets have to be defined. Depending upon the rigour of the compliance requirement, the time period for intermediate monitoring can vary. Compliance is also important in cases where resource constraints are critical to the success of the intervention.

2.5 Classification of Indicators

The indicators for M&E can be classified based on their **measurability** and the **type of task** undergoing M&E. In terms of **measurability**, the indicators can be divided into qualitative and quantitative.

- ***Quantitative indicators*** can be measured in hard numbers. It is easier to have well-demarcated thresholds for quantitative indicators. However, confining measurement to figures does not capture the softer aspects of adaptation intervention. For example, crop yields per hectare are a good indicator of the effectiveness of the implementation of new drought-resistant seed varieties.
- ***Qualitative indicators*** are more subjective and can change based on the judgment of the researcher or the respondent. An example is peoples' narratives on the effectiveness of training programmes to manage emergency flood situations. To some extent these can be tabulated as binary variables or scales.

In terms of **tasks**, the indicators can be classified as process indicators, outcome indicators and impact indicators.

- ***Process indicators*** focus on design, compliance with a pre-determined process, and the actual implementation processes involved in the adaptation intervention.
- ***Outcome indicators*** focus on a defined set of goals or deliverables at the end of the adaptation programme intervention.
- ***Impact indicators*** deal with the effectiveness of the intervention in terms of the broader objectives and aims of implementing a specific adaptation intervention.

Box 1. Process, outcome, and impact indicators: an example of coastal city protection

To understand the differences among the three categories of tasks, let us take the example of a coastal city that needs to protect its community from increasing sea levels and storm surges up to three kilometres inland. Let us assume that dykes are being built as an adaptation measure. In this case, process indicators would include indicators like budget compliance, intermediate project construction targets, compliance with materials used etc. Outcome indicators would include indicators like per unit cost, total implementation cost, ratio of public to private investment etc. Impact indicators would include indicators like annual maintenance costs, the life span of the protection, policies supporting a measure etc. These process and outcome indicators assume that careful thought has gone into the choice of adaptation strategy and that the strategy is an appropriate choice. However, these indicators will not necessarily contribute towards making a choice. For that reason, in the design and evaluation of the intervention, one would need to consider answers to questions like, whether the intervention will provide immediate protection or not, what is the life span of the protection, what will be the scale of prevention at the time the intervention comes to an end, as well as, say, fifteen years after the implementation. If appropriate weights are assigned based on the programme's objectives, the impact indicators can help make a choice between protection by dykes, protection by dykes and coastal vegetation like mangroves, and protection by coastal vegetation alone. Outcome indicators, on the other hand, would most likely not identify how the coastal community is protected, as the goal is to transit from stage t_0 to stage t_1.

A broader classification for these indicators would distinguish those that measure **effectiveness** from those that measure **efficiency**.

- ***Efficiency indicators*** measure the output against each unit of input. Therefore all the indicators, such as per unit cost of technology, per unit cost maintenance costs etc., fall under the broader indicator category of efficiency indicators.
- ***Effectiveness indicators*** measure inputs vis-à-vis impacts. The number of people trained in emergency responses in a disaster for a specific input cost is a measure of efficiency. How many of them actually use the training in an emergency event or how many qualify an end-of-course test is a measure of effectiveness.

Both have their advantages and disadvantages, and neither cannot be weighed more than the other. Depending upon the context and what is being monitored and evaluated, the choice of indicators will change. Continuing with our example of introducing a drought-resistant crop in a village, the following table lists some examples of indicators and their broad categories.

Table 1. Examples of various categories of indicator

Quantitative Indicators	- Cost of additional resources vs. additional crop production - Number of beneficiaries
Qualitative Indicators	- Acceptability of crop type - Legal acceptance of the drought-resistant crop
Process	- Frequency of adding fertilizer - Sowing process
Outcome	- Number of beneficiaries - Increase in production
Impact	- Increase in income levels - Increase in health standards
Efficiency	- Cost of additional resources vs. additional crop production - Additional labour hours vs. additional crop production
Effectiveness	- Water requirement - Soil moisture requirement

2.6 Challenges to Monitoring and Evaluation

The need to have an effective M&E system for adaptation interventions is clear. However, the design of a robust mechanism can be filled with many practical problems. Following are some of the common issues that planners face when designing and implementing M&E mechanisms.

2.6.1 Selecting the Right Indicators

The choice of indicators that are appropriate is one of the most challenging tasks in designing an M&E system. Choosing the process indicators confines the monitoring process to questions of compliance. Outcome indicators, on the other hand, emphasise the future state that is being targeted. For example, the adaptation measure to increase green cover to hold the soil in place and prevent soil slippage may best be measured as an outcome indicator where the ultimate goal is to have a predetermined green area with specific plantations. If the objective is not just to prevent soil slippage but to promote biodiversity in a region, then having process-driven indicators may be more relevant. Impact indicators measure the overall impact of an adaptation intervention. In most cases it is possible only to measure the direct or primary benefits of a measure. However, the choice of the adaptation and its subsequent success may also depend on the amount of secondary benefits. Similarly, it is difficult to take stock of the damage that was avoided in the process. Having a system in place nationally increases the complexity of the system.

For example, if a choice has to be made between increasing the depth of a bore well or introducing drip irrigation to deal with drought, the two strategies will have very different primary and secondary benefits and will avoid different types of damage. Choosing a mixture of all these categories of indicators may make the M&E process quite complicated, and it can be difficult to prioritise which of these indicators should have more weightage than the other. Even when a specific basket of indicators has been designed, they sometimes inadequately capture the phenomenon. A good measure for handling this problem is to enlist the processes that best capture the implementation of the adaptation intervention. In order to design an indicator system for monitoring and evaluation at the national level, identifying the criteria for successful adaptations that are appropriate for the country is important. These criteria determine the nature of successful adaptation. The choice of relevant indicators would then depend on the specifics of the investment. It is within the realm of these success criteria that the indicators are chosen.

2.6.2 Measuring the Baseline

Measuring the stage zero against which the changes or progress are to be measured faces two problems. *Firstly*, given the influence of the changing climate and multiple other factors, it is difficult to identify the base case. *Secondly*, the conditions that describe the baseline may be too broad to be captured. Quite often it is difficult to say definitively whether the base case existed at t_0 or t_{-1} or at any other time frame. For example, a particular time period may be very facilitative for a specific crop. Now, if the effect of an adaptation intervention is measured against this baseline, it will underestimate the contribution of the intervention under normal circumstances. Similarly, if targets are defined based on this baseline, they may become too ambitious. In practice, it is common to assume the base time period as one in which the adaptation intervention was introduced. This issue to a certain extent can be dealt with by taking an average scenario for various time periods as the base period. The other way to is to define an operating range based on historical data against which progress can be measured. For example, if a base case for a drought-prone region is being defined, then this could take the form of a range of indicators like seasonal rainfall, water-table levels etc. Alternatively, average values of observations could be used. The limited availability of information, which usually is the case, hinders this process. There are also arguments that historical baselines are becoming less representative as the pace of climate change increases.

2.6.3 Qualitative vs. Quantitative Indicators

While selecting indicators for M&E, the emphasis is placed on selecting SMART indicators. There is an inherent emphasis on the measurability of the indicators. In some cases it may just be important to have more qualitative indicators. For example, a farming community's experience of a specific agriculture technique introduced as an adaptation intervention may not be adequately captured by yield metrics or input–output ratios: it could also be in the shelf life of the final product, or even in how the end users find the taste of the final product. Nor may indicators be able to capture labour-intensive practices adequately using input–output ratios. Sometimes the adaptation process can best be evaluated from the narratives of beneficiaries. The choice of qualitative indicators has to be pursued even more cautiously because of the possibility of multiple interpretations of the same phenomenon.

To deal with these issues, the M&E mechanism should not rely solely on one category of indicator. Having objectivity about the processes involved in the adaptation intervention and how best they can be captured through indicators are essential. Qualitative indicators can effectively fill the gaps and do the validation for quantitative indicators.

2.6.4 Setting Intermediate Targets

Adaptation is an ongoing process, and no intervention can have just one final goal. As the adaptation process is very specific to certain conditions, setting intermediate targets is a complicated task that creates problems in monitoring a measure. As there are no established practices, there are no intermediate benchmarks. The progress trajectory for an intervention cannot be uniform. For example, in training human resources for emergency management, there is a learning curve where people will start picking up faster towards the of the programme.

2.6.5 Smart Indicators

Often indicators are designed just in order to monitor the adaptation intervention, and evaluation is possible only once the adaptation intervention has ended. However, evaluation also entails that indicators help in evaluating a favourable adaptation intervention. The mechanisms as designed may not be equipped to make this choice. These problems arise primarily as a result of the time frame for evaluation and the locus of the benefits being measured. For example, if a coastal city has to be guarded against rises in sea level and storm surges, the indicators will not necessarily help in making a choice between building dykes and planting mangroves. Even if there are the mechanisms to make a choice, the choice would be different for different time frames. Dykes can be easily constructed within two to three years, but mangroves will take a lot more time to grow tall and dense enough for effective protection. If the assessment period is only three years, then having coastal dykes supersedes having mangrove plantations. The evaluation will differ when the assessment period increases to thirty years. Similarly, accounting for the primary and secondary benefits may yield different choices. The quality and availability of data can hinder use of certain indicators. Often a lack of well-defined and consistent metrics for adaptation makes the measurability of indicators problematic. The indicators may not necessarily be smart, but the understanding of M&E has to be an integral part of adaptation planning processes. The indicators are not independent silos and cannot be introduced in the middle or at the end of the programme.

2.6.6 Replicability

Just like adaptation measures, the indicators designed for M&E are very much context-specific. While they definitely give cues for designing a framework when conducting M&E for another adaptation intervention, they cannot be completely the same, even when the conditions are somewhat similar. The indicators will change based on the objective of the programme, the time frame, the scale of the intervention, the sector etc. Therefore, there cannot be any benchmarks for indicators. There is no specific way to deal with this problem apart from treating the M&E as an independent exercise for each adaptation programme.

2.6.7 Efficiency vs. Effectiveness

The M&E process should not be very expensive and should justify the costs involved. This also raises the issue of the efficiency and effectiveness of the indicators. The indicators must be efficient, that is, they should be cost-effective in terms of the inputs required and the outputs achieved, as well as effective, that is, should sufficiently capture the process. To put it simply, the indicator and its mode of measurement should justify the amount of information it captures per unit cost. For example, an adaptation intervention is used for the afforestation of a patch of land measuring 25km X 25km within a ten-year time frame. The growth progress can be monitored using an indicator of the ratio of the percentage of green cover very accurately by having a high-resolution satellite stay focussed on the patch for ten years. This level of detail and accuracy in information may not be needed because setting up a remote-sensing project for this small are will be very expensive. The same indicator can be measured through ground-level surveys once a year. The indicator will now have a higher margin of error, but the measurement cost is much lower. It is therefore important to strike a balance between efficiency and effectiveness.

2.6.8 Time Period of Evaluation

Evaluation time frames should be determined at the beginning of the intervention. Longer time frames may evaluate strategies differently than shorter ones. Some adaptation alternatives have a more sustainable approach and take a little longer to produce results. When evaluated prematurely, the intervention may completely fail. However, if the objective demands immediate results, the time period for evaluation should be shorter. An effective way of dealing with this would be to evaluate at multiple time periods unless this increases costs exorbitantly. This would depend on the nature of the intervention and programme objective.

Examples of different types of indicators for key sectors are given in Annex 1. Annex 2 lists examples of indicators in key priority areas.

2.6.9 Indicator Issues that are Distinctive at National Level

Hedger et al. (2008) have identified a number of challenges, which, aside from the general challenges described in the above sections, relate to national-level M&E of adaptation. These include:

- The importance of ‘mainstreaming’ in relation to adaptation. While specific adaptation interventions (e.g. the project level) may be measured in the context of the sector and local community at which they are targeted, at the national level, adaptation, and therefore also any evaluation, requires strong coordination across sectors, policies, strategies and plans. This is because progress in addressing climate change sees adaptation move from an environmental challenge to one that is relevant to the economy, social policy and development in general.
- The challenge of integrating adaptation into the potentially short lifetime of government plans, particularly in national contexts where stable governments may be short-lived or easily swayed from one policy priority to another.
- Overcoming some of the institutional issues, which may be present at all levels, but particularly challenging nationally, where it may be undiplomatic to address them specifically, partly because of potential problems with corruption.
- The overriding drive towards achieving MDGs. Particularly nationally, it would be unproductive to introduce objectives which are separate from or perceived to be a distraction from the MDGs. Therefore, the pragmatic approach will look to develop targets and indicators for adaptation that can somehow be aligned with MDG priorities.
- In line with current approaches to development, adaptation efforts are highly integrated. Most projects make use of multiple strategies and address multiple sources of vulnerability. Many bridge sectoral boundaries and address more than one impact associated with climate change.

3. Monitoring and Evaluation Frameworks

The M&E framework usually gives a bird's eye view of how the process and activities are arranged in the overall M&E system. Typically, a framework will include indicators, data sources, tools and methods, timelines, decision-makers, executors etc. In the literature there are many sources that do not distinguish between the framework and the system. Many organisations treat the M&E framework in a simplistic manner as a template or table describing the indicators that will be used in making programme assessments. The purpose of having a framework for M&E is to provide a structure to the set of activities planned for M&E. This makes the assessment of programme goals at various time intervals easier and helps define the relationships among internal activities like flow of inputs, inputs and outputs, and external relationships to inputs and impacts. Generally, M&E frameworks are structured around the following structure was proposed by a report by United Nations High Commissioner for Refugees (UNHCR, 2003) on displaced people in the context of project management.

- Determine the overall objective of the M&E mechanism and identify the information requirements.
- Ensure interventions have clearly defined objectives.
- Draw up consistent reporting tools.
- Identify data sources for indicators.
- Identify resource requirements, including human resources.
- Assign responsibilities for activities within a define timeframe.
- Set reporting and information dissemination and feedback mechanisms.

These steps also form part of the overall M&E system design process. There are no rules of thumb or well-defined guidelines for designing a framework for evaluation and monitoring. The following sections present a general overview of commonly used frameworks for M&E in the context of climate change adaptation interventions.

3.1 General Overview of Approaches to M&E Frameworks for Climate Change Adaptation

In the following, the key characteristics of approaches to M&E frameworks are summarised. The frameworks are also presented in Annex 3.

3.1.1 Results-Based Monitoring and Evaluation

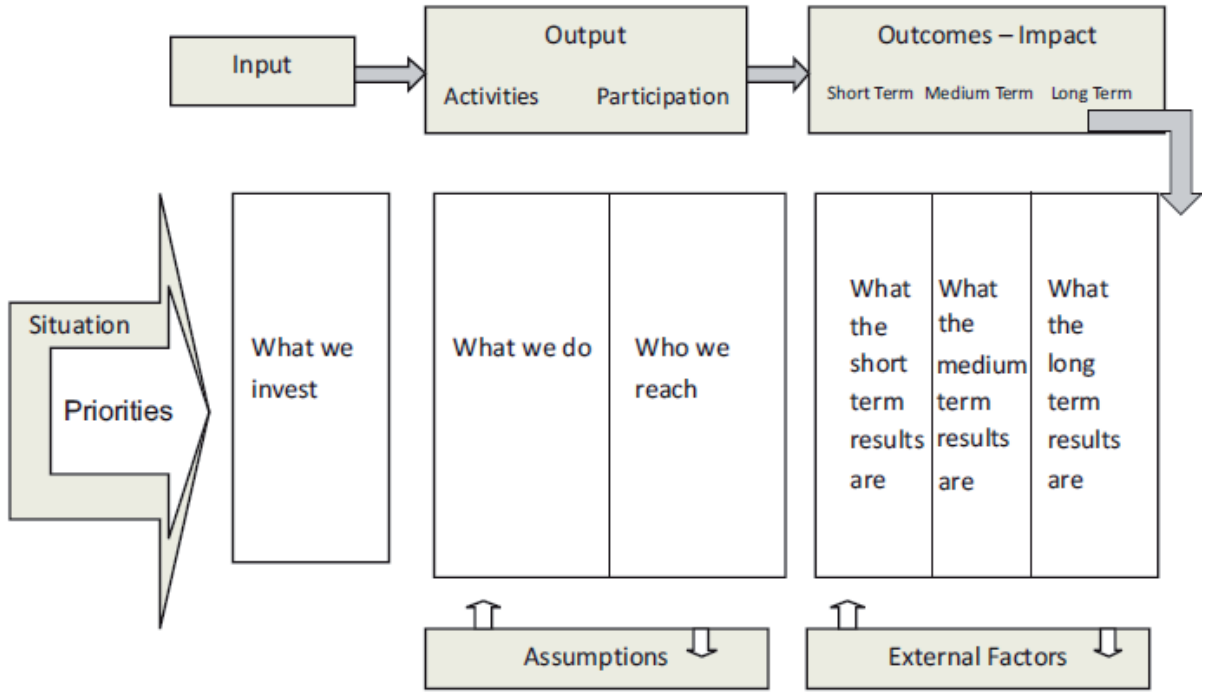
One of the most popular M&E approaches is the Results-Based M&E approach. This is based on the theory of 'Results-Based Management' (RBM), which encompasses the processes of planning, implementation and M&E. Results-based M&E assesses a programme or an activity continuously in order to achieve the targeted objectives. The evaluation is based on the impacts and/or benefits that the programme or the activity brings about for the targeted segments (Farrell 2009; Spreckley 2009; UNDG 2010; WFP 2009; Kusek and Rist 2004). It is different from conventional assessment mechanisms because of its emphasis on continuous feedback to achieve programme goals. Therefore, the M&E process is an ongoing process that does not happen at the end of the programme implementation. According to the United Nations Evaluation Group, RBM aims at 'achieving improved performance and demonstrable results' (UNEG, 2007). It is different from Peter Druker's Management by Objective as it offers flexibility that is needed to operate in cases where either the goals are not well defined or they keep changing along with programme

implementation or due to changes in factors external to the programme (ADB, 2006). This monitoring mechanism has been adopted by various agencies of the United Nations and many other organisations working in the development field. An example of the RBM approach to M&E is described in Annex 4.

3.1.2 Logical Framework Approach

The logical framework approach was developed for the United States Agency for International Development (USAID) in the late 1960s for use in participatory project planning by Practical Concepts Incorporated (PCI, 1979). It is a systematic approach for project planning and implementation and involves the preparation of a log frame matrix which gives an overview of the project or current situation. The matrix divides the programme information into problem, goal, purpose of the programme, outputs or deliverables of the programme, and activities for achieving the outputs. For each of these, objectively verifiable indicators (OVIs) are identified along the sources of information or the means of verification for these indicators and their relevant assumptions (DFID 2011; EC-CSF 2011; Jensen 2010; CIDA 2001). In the planning process, these OVIs provide measures for tracking the progress of the programme. This approach is often criticised for lack of flexibility once the OVIs are defined, overt emphasis on the measurability of the indicators and the narrow focus on problems instead of solutions (Bakewell & Garbu, 2005). These affect the quality of OVIs and thus the M&E mechanism.

Figure 2. Illustration of a simple logic model



Source: Sambodhi (n.d.)

The logic model can also be illustrated from a simple illustration (see Table 2), which also captures M&E phases.

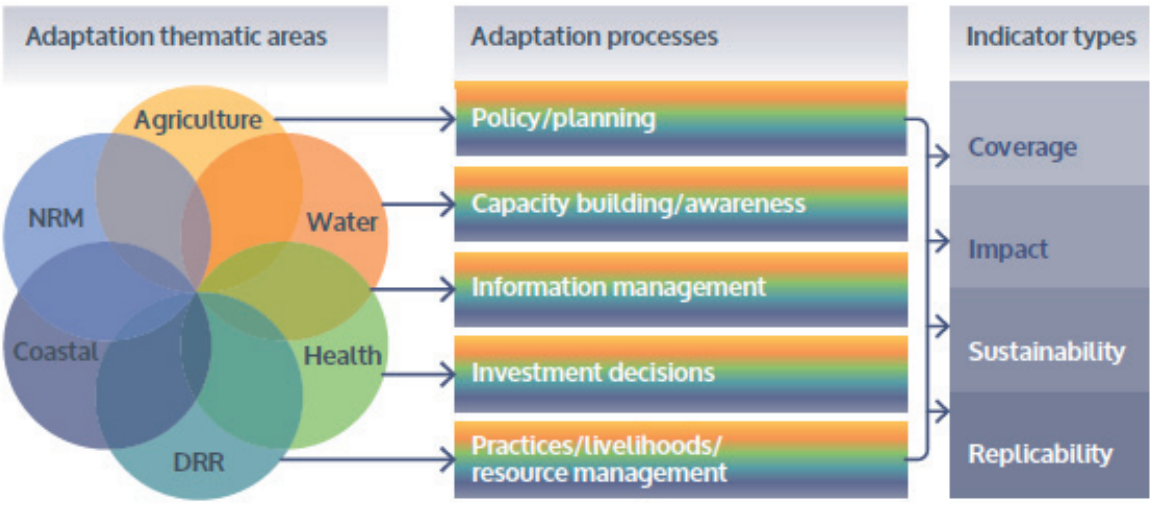
Table 2. Illustration of a simple logic model

Inputs	Process	Results	Outcome	Impact
- Money - Staff - Technology	Agricultural conservation technologies to small-scale rural farmers	Enhanced agricultural productivity and improved availability of water	Improved drought-coping capacity	Reduction in poverty
Monitoring			Evaluation	

3.1.3 Monitoring and Evaluation Framework

The United Nations Development Programme's (UNDP) framework on Monitoring and Evaluation Adaptation to climate change is focused more on processes than on planned actions. The framework is organised into seven thematic areas, viz., agriculture and food security; water resources and quality; public health; disaster risk management; coastal zone development; natural resources management; and infrastructure (UNDP, 2009). These thematic areas are mapped to the Millennium Development Goals (MDGs) (UNDP, 2007). The relationship to climate change impacts is more complex, as climate change has more cross-cutting issues, and the intervention may have an overlap across various thematic areas or may address multiple targets of MDGs (Sanahuja, 2011). The framework views adaptation interventions with the objective of improving adaptation capacity and reducing the vulnerability of the specific sectors under consideration. The M&E indicator guidance is specific to programme or portfolio. The categories of indicators for M&E can be clubbed together under the broad themes of coverage, impact, sustainability and replicability.

Figure 3. Illustration of the monitoring and evaluation framework



Source: Bours et al. (2013)

3.1.4 Tracking Adaptation and Measuring Development

The tracking adaptation and measuring development (TAMD) framework is being developed by the International Institute for Environment and Development (IIED) and its partners. TAMD is an assessment framework for adaptation intervention that tracks and evaluates the effectiveness of an adaptation intervention (Brooks et al. 2011). The framework defines successful adaptation in terms of feasibility, effectiveness, efficiency, acceptability, equity and sustainability and therefore is not just confined to capacity-building. The M&E process tries to strike a balance between top-down and bottom-up mechanisms. The 'Track 1' or top-down assessment encompasses issues like the integration of climate change into policies, institutional arrangements for dealing with climate change etc. (IIED, 2014). The assessment in Track 1 can be qualitative in nature. 'Track 2' or the bottom-up assessment focusses on the identification of contextually relevant indicators of development and vulnerability (IIED, 2013). An overall assessment of the success of an intervention is made by combining these two approaches.

3.1.5 Robust Decision-Making

Robust Decision-Making (RDM) is an analytical framework developed by the RAND Corporation. This framework is used for programmes in deep climate uncertainty. The decision-making process is not dependent on the future state of the climate. Therefore, RDM deals with how plans perform in a plausible future and which conditions may be crucial for the programme's success (Hall et al. 2012; Lempert et al. 2006; Lempet and Kalra 2011; RAND Corporation 2013). This helps decision-makers decide on robust strategies that will work again in a wide range of future scenarios (Lempert and Collins 2007). Evaluation is based on the assessment of a future desirable state vis-à-vis the base case. RDM is primarily a decision-making tool, but it involves a trade off with assessment, and therefore it is also used for programme reviews aligned closely to iterative adaptation management concepts of M&E (Watkiss & Dynzynski, 2013).

3.1.6 Opportunistic Impact Measurement

Opportunistic impact evaluation assesses the adaptation intervention based on a comparison of the state of a group, region or beneficiary with and without (or before and after) intervention (Karkoschka et al. 2013). In the same region, the framework measures the overall state at t_0 before intervention and at t_1 after implementation of the intervention. If measured at the same time, it measures two similar regions, one with the intervention and one without it. This is analogous to the control and treatment groups often used in the social sciences. This essentially measures impacts or evaluates the intervention and does not have any provision for monitoring. The degree to which planned impacts are achieved (depending upon the baseline) after the intervention determines the success of the adaptation. Since two states are being compared in this framework, it is heavily dependent on the baseline assessment.

3.1.7 Outcome Mapping Approach

The Outcome Mapping project assessment framework has been designed by the International Development Research Centre. The framework maps the activities of a programme to the outcomes it brings about in its beneficiaries (primary, secondary etc., called 'boundary partners'). Outcomes are defined as 'changes in the behaviour relationships activities or actions of the groups and organisations with whom a programme works directly' (Earl, Carden, & Smutylo, 2001). The framework is used to increase the effectiveness of an intervention by linking the intervention activities directly to outcomes. The framework focusses on planning and M&E, and can therefore be used for assessments during the design, mid-term and post-hoc implementation of the programme (Jones & Hearn, 2009). In programmes seeking transformational changes in behaviour, the framework specifies stakeholders, partners and the other people involved and their respective duties (IDRC, n.d.). Hence, it facilitates iterative learning, accountability and collaborative learning. It can deal with complex issues in adaptation, but focuses more on contribution than intervention.

3.1.8 Objectives-Oriented Project-Planning (ZOPP)

Objective-Oriented Project-Planning (Called Zielorientierte Projektplanung in German) has evolved from the log frame approach which was developed for USAID. This has been developed by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ - German Technical Cooperation) (GTZ, 2002). It entails forming a Project Planning Matrix as an M&E framework and lists the tasks of the programme, the intended outputs, the relationship between output and input, the responsibilities of stakeholders, intermediate goals, budget compliance, time line, etc. The pre-project planning phase also entails an assessment phase which reviews stakeholder participation, anticipated problems, objectives and possible alternatives to objectives, and resources in case of unanticipated problems (Helming & Göbel, 1997). Although it has been widely adopted for the rigour of its methods, it is less flexible to changes that come with time and hence not suited for implementations under circumstances of deep uncertainty.

4. Existing National-Scale Efforts to Monitor and Evaluate Adaptation Policies and Strategies

A number of countries have developed and are developing national monitoring and evaluation frameworks. Most frameworks are still at an early stage, where development and planning are still in progress. Implementation of the frameworks has started in a number of countries, including Norway, France and the UK. In Norway, existing initiatives and systems are used as a learning mechanism for assessing which approaches constitute effective means of reducing climate change vulnerability and risk. In the Philippines and France, the frameworks are used to specify the desired outputs and outcomes of adaptation, while those in Mozambique and Nepal are closely connected to and informed by other major adaptation initiatives. Other countries, such as the UK and Germany, target their frameworks to a number of selected priority areas. Most frameworks focus on monitoring, though a few countries include an evaluation part. In the Philippines, the framework focuses on identifying actions that are most effective in creating the changes that will decrease vulnerability to climate change, as well as in elaborating on what has enabled this desired change. Therefore, the Philippine framework includes the desired results chain as identified in the Philippines National Climate Change Action Plan 2011-2028, including ultimate, intermediate and immediate outcomes, activities, outputs and complementary indicators (GIZ 2013). In France, the objective of the monitoring system is to monitor progress in implementing actions under their National Adaptation Plan (NAP) and the achievement of specified NAP outcomes. NAP implementation is thus used as a mean to monitor the resilience of the country to climate change, with the assumption that implementation of the NAP reduces the country's vulnerability to climate change (OECD 2015).

A report by GIZ (2014) provides a comparative analysis of national frameworks for the monitoring and evaluation of adaptation. An overview of the systems, their approach to monitoring and the status of implementation is provided in Table 3 below.

Table 3. Overview of existing national-level monitoring systems

Country	Approach	Status
Australia	Identifies risks to essential services (e.g. energy and water supply) and allocation of responsibilities to persons or organisations best placed to address the risks. Indicators of adaptation drivers, activities and outcomes.	National Adaptation Assessment Framework under development, initial set of twelve indicators identified and currently subject to consultation. Under review.
Germany	Climate change impacts and response indicators for fifteen action and cross-sectional fields to monitor adaptation. Periodic evaluation of the German Adaptation Strategy.	Indicator system under review. Reporting expected to start in 2015.
France	Process indicators and some outcome indicators for twenty priority sectors.	Indicator system reflects the 230 measures identified in the French National Adaptation Plan 2011-2015. Operational and ongoing.

Kenya	Indicator-based system using outcome- and process-based monitoring, reporting and verification (MRV) of actions under the indicators measured at the national and county levels.	Kenyan National Climate Change Action Plan, with top-down and bottom-up indicators identified at the national and county level. System currently under review.
Morocco	Using indicators to monitor changes in vulnerability, adaptation progress and their impacts. Around thirty indicators in each of the two pilot regions.	Indicator system for the two regions integrated into the Regional Environmental Information System (SIRE). Under review.
Mozambique	Monitor climate change impacts and inform national budget allocations and international climate finance.	Draft framework proposed, including a set of indicators. Under development. Full implementation expected by 2020.
Nepal	Programme-level indicators (based on PPCR core indicators). Indicator system piloted for eight climate change projects and indicators linked to National Adaptation Programmes of Action (NAPA) priorities; matched by individual project-level indicators. Qualitative documentation of lessons learned. 149 sub-national 'environmentally friendly' indicators for different sectors (including climate) and scales (household to district).	Under development but piloted for eight major climate change projects that form the core of Nepal's Climate Change Program.
Norway	Process- and impact-monitoring using repeated surveys of exposure and adaptive capacity.	System focuses on learning by doing, structured around regular national vulnerability and adaptation assessments. Operational.
Philippines	Indicators linked to results chains for seven strategic priority sectors. Climate Change Vulnerability Indices for measuring, monitoring and evaluating local vulnerability and adaptation.	Preliminary set of mostly process indicators developed. Under review.
South Africa	Established outcome-based system will be used to monitor climate change impacts at appropriate spatial densities and frequencies. Report progress on the implementation of adaptation actions.	Preparatory phase, e.g. the monitoring and evaluation team is being assembled, South Africa's climate change actions are being mapped, and the National Climate Change Response Database is being updated.
United Kingdom	Mixture of approaches: regular, detailed climate change vulnerability assessments; indicators to monitor changes in climate risks, uptake of adaptation actions and climate impacts; decision-making analysis to evaluate whether degree of adaptation is sufficient to address current and future climate risks.	Regular, detailed adaptation-assessments to monitor changes in climate risks using indicators, and evaluating preparedness for future climate change by analysing decision-making processes. Operational.

Source: Based on GIZ (2014)

4.1 Indicators used in National Monitoring Systems for Tracking Adaptation

All national monitoring systems use indicators to track progress in adaptation (reflected in Table 4). In addition they combine these indicators with knowledge inputs from experts in order to interpret the reporting by indicators. Most frameworks mix qualitative and quantitative methods, pilot projects, expert judgements and, for example, group assessments.

Most national-level monitoring systems have organised their indicators according to categories such as exposure indicators, vulnerability indicators, climate change impact indicators, response indicators and so forth. In A few cases (France and Philippines) countries do not use categorisation, as they link their indicators to specific activities in their NAPs.

In Kenya's national-level monitoring system, outcome-based indicators are provided at the county level to build and measure institutional capacity at that level. An example of such an indicator is the number of county ministries that have received training in a specific climate-related area as a result (outcome) of initiatives taken at the national level.

Though both Finland and the United Kingdom use process-based indicators for evaluating progress in adaptation, Finland uses a sector approach, while the United Kingdom focusses on the different administrative levels. Examples of the indicators involved are given in Table 4 below.

Table 4. Comparison of process-based indicators used to evaluate progress in adaptation in Finland and the United Kingdom

Indicators used by the United Kingdom	Indicators used by Finland
Getting started: - Potential threats and opportunities across estate and services starting to be assessed - Next steps to build on that assessment identified and agreed upon	- Need for adaptation recognised among a group of pioneers in the sector - Little research done on the impacts of or adaptation to climate change - Some adaptation measures identified but not yet implemented
Public commitment and impacts assessment - Public commitment made to identify, communicate and manage climate-related risk - Local risk-based assessment of significant vulnerabilities and opportunities made	- Need for adaptation measures recognised to some extent in the sector - Impacts of climate change known indicatively (qualitative information), taking account of the uncertainty involved in climate change scenarios - Adaptation measures identified and plans made for their implementation, some of them launched
- Comprehensive risk assessment - Comprehensive risk-based assessment undertaken and priority risks for services identified - Most effective adaptive responses identified and incorporated into council strategies, plans, partnerships and operations - Adaptive responses implemented in some priority areas	- Need for adaptation measures quite well recognised in the sector - Impacts quite well known, taking into account uncertainty - Adaptation measures identified and their implementation launched - Cross-sectoral cooperation on adaptation measures started

Comprehensive action plan - Climate impacts and risks embedded across council decision-making - Comprehensive adaptation action plan developed - Adaptive responses implemented in all priority areas	- Need for adaptation measures widely recognised and accepted in the sector - Adaptation incorporated into regular decision- making processes - Impacts well known, within the limits of uncertainty - Implementation of adaptation measures widely launched and their benefits assessed at least to some extent - Cross-sectoral cooperation on adaptation measures an established practice

Source: UNFCCC (2010)

In Kenya, the National Climate Change Action Plan (NCCAP), which has been developed to cover both mitigation and adaptation, has developed a supplementary framework (the National Performance and Benefits Measurement Framework, NPBMF) to track both mitigation and adaptation activities. The framework builds on the TAMD framework developed by IIED and includes both national and county-level process- and outcome-based indicators to assess both institutional adaptive capacity and vulnerability to climate change. The NPBMF is linked to existing national-level indicators which are already being measured on a regular basis.

The Kenyan framework, as already mentioned, includes a number of vulnerability indicators (Table 6) to supplement the institutional adaptive capacity indicators (Table 5). These indicators were identified through stakeholder consultations and resulted in a larger number of indicators, which were finally reduced to ten outcome-based indicators representing what had been identified during the consultations, as well as being closely linked to Kenya's Vision 2030. A thorough analysis of the Kenyan framework is provided in OECD (2015).

Table 5. Kenya county-level institutional adaptive capacity indicators

Indicator description
% of county roads that have been made 'climate resilient' or that are not considered vulnerable
% of new hydroelectric projects in the county that have been designed to cope with climate change risk
% of population by gender and areas subject to flooding and/or drought in the county that have access to information from the Kenyan Meteorological Department on rainfall forecasts
% of people by gender in the county permanently displaced from their homes as a result of flooding, drought or sea-level rises
% of poor farmers and fishermen in the county with access to credit facilities or grants
% of total livestock numbers killed by drought in the county
% of area of natural terrestrial ecosystems in the county that have been disturbed or damaged
% of water demand that is supplied in the county
% of poor people by gender in drought-prone areas in the county with access to reliable and safe water supplies
Number of ministries at county level that have received training for relevant staff on the costs and benefits of adaptation, including the evaluation of ecosystem services

Table 6. Kenya national-level vulnerability indicators

Indicator description	RVD	HRF	SLR	HF
Number of people by gender permanently displaced from their homes due to drought, flood or sea level rises	Y	Y	Y	
Number of hectares of productive land lost to soil erosion		Y		
% rural households with access to water from a protected source	Y			
% urban households with access to piped water	Y			
Cubic metres per capita of water storage	Y			
% of land area covered by forest	Y	Y		
% of classified roads maintained and rehabilitated		Y		
Number of urban slums with physical and social infrastructure installed annually	Y	Y		
Number of households in need of food aid	Y	Y	Y	
Number of County Stakeholder Fora held on climate change	Y	Y	Y	Y

Source: OECD (2015)

Key: RVD – increase in rainfall variability and drought; HRF – increase in heavy rainfall and floods; SLR – sea level rise; HF – increase in occurrence of abnormally large hailstones or frost in mountain areas. *Note:* The figures in [square brackets] are the reference numbers for county-level indicators to which these national-level indicators relate.

4.2 Data

Some national-level monitoring systems are not very data-intensive (Morocco and France) and utilise data which have already been collected, while other systems (United Kingdom) make an effort to collect and aggregate a more diverse and complex set of data. The approach to data aggregation also differs between national-level monitoring systems, with some aggregate data belonging to the sub-national level, some the sectoral or ministerial levels, and others the project and programme level. Few national-level monitoring systems propose to collect new data, and a common denominator between monitoring systems is that they all use data from existing systems. The German monitoring system for adaptation focusses on strengthening existing data sets (for example, in environmental monitoring) by adding adaptation aspects at the federal and state levels. In the Philippines data are taken from an already established community-based monitoring system, whereas in France the data for the adaptation monitoring system is extracted from existing national M&E systems constructed for other purposes at ministerial levels in France. The frameworks and their data sources are reflected in Table 7 below.

Table 7. National monitoring systems and data requirements

Country	Indicators	Framework	Data resources
Australia	Indicators of adaptation drivers, activities and outcomes.	Outcome-based framework	New and existing data sources
Germany	Impacts indicators, response indicators	Mixture	Existing data sources
France	Process and outcome indicators	Mixture	Existing sectoral M&E systems and data bases focus on easy access data and simple information

Kenya	Process and outcome indicators	Results-based management framework	New and existing data sources
Morocco	Indicators to monitor changes in vulnerability, adaptation progress and their impacts	Mixture	New and existing data sources
Mozambique	Under development	N/A	N/A
Nepal	Indicators linked to NAPA priorities and national climate projects	Results-based management framework	Existing data sources
Norway	Process and impact indicators	Mixture	New and existing data sources
Philippines	Process indicators	Results-based management framework	Existing data sources
South Africa	Outcome indicators	Outcome based framework	Existing data sources
United Kingdom	Progress and impact indicators	Mixture	Existing data sources

Source: Based on GIZ (2014)

4.3 Resources

As reflected in Table 7, most of the frameworks are still under development or in their pilot phases, and hence limited information exists on the costs associated with development and implementation of the systems. Making some estimates of the costs is further complicated by the integration of most of the systems with other existing systems and their reliance on in-kind contributions from the ministries and institutions involved in the existing processes. The French system relies heavily on in-kind contributions, the United Kingdom system is highly autonomous and highly resource-intensive, while in Kenya the system is estimated to require up to a hundred people for three years before the system is fully operational and running.

5. Monitoring and Evaluation Systems for Adaptation in the Latin American Region

All Latin American countries[4] have developed at least one strategy or plan for climate change and/or adaptation to climate change that establishes development objectives, roles and institutional responsibilities. These long-term instruments guide government action on climate change or adaptation and determine sectoral priorities. Typically they have been developed for the field of climate change or for sectors that are key to sustainable development, such as in the areas of risk reduction and infrastructure. Although it is common for the documents that outline such strategies or plans to mention the importance of defining indicators in order to assess the country's or region's progress in adapting to climate change, few of them include such definitions or their implementations.

Several examples of programme and project assessments that support the implementation of adaptation to climate change actions in the region have been identified. These programmes and projects are medium-term instruments that define the objectives typically found in the strategies and plans mentioned in the preceding paragraph. Although their temporal and geographical scope and characteristics are different, we have included some of these experiences in this review not only because they demonstrate greater progress in defining indicators, but also because they have been assessed through baseline surveys, midterm assessments or final evaluations, as well as systematising some lessons around the M&E process.

In this analysis, we use publicly available information to present eleven M&E experiences carried out in countries in the region. These experiences include eight government strategies and plans (in Argentina, Brazil, Chile, Colombia, Honduras, Mexico and Panama) and two adaptation programmes and projects (in Bolivia and Peru) (Table 8). Evaluations of individual adaptation practices (see, for example, European Commission 2015; Aldunce et al. 2008) were not included in the analysis.

4 The analysis included a review of experiences from six Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama) and eleven from South America (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela).

Box 2. Good practices for the design and operation of M&E systems for adaptation

The M&E systems for programmes and projects that are more limited to regional or local spaces highlight other aspects for making planned adaptation actions more sustainable (see the National Adaptive Capacity Framework in Dixin et al. 2012). These aspects have been used as criteria for assessing good practices for adaptation to climate change actions (see the case of Bolivia in Flores et al. 2010):

- **Complete.** Refers to the inclusion of relevant factors in the formation of policies, norms and procedures.
- **Transparency and Participation.** Measures the degree of transparency and participation, evaluating to what extent the information is accessible to the public, has been disseminated and whether it can be utilised. It also assesses whether important stakeholders have access to decision-making through meetings, workshops or forums for consultation, and if decision-makers seek out inputs from different actors to design policies.
- **Accountability.** Assesses whether institutions have a clear mandate to carry out the adaptation functions; if the supervision systems are appropriate; if the coordination within the institution and with other institutions is adequate; and if there are systems in place for citizens to review and enforce decisions. Also assesses whether there are systems for the institution(s) involved to assume their responsibilities and to be accountable.
- **Capacities.** Evaluates whether institutions that develop and implement adaptation policies have appropriate knowledge, capacities and budgets.
- **Implementation.** Aims to learn if the plans and policies have been implemented by the responsible organisations and whether they are implementing plans and programmes.

Before presenting the conceptual frameworks, the types of indicators and the sustainability level of these experiences, we will highlight some aspects of their design and implementation:

- The long-term systems include indicators related to different government sectors and are implemented, or are expected to be implemented, through collaboration among different government agencies and other sectors of society. The programme and project systems place more emphasis on the characteristics of the adaptation process (such as transparency and participation), the progress of the institutional framework and the capacity-building support to civil organisations and local government (Table 9).
- The majority of long-term systems identify indicators only at the national level, without specifying other levels of analysis (such as regions, basins or administrative divisions). Medium-term programmes and projects focus on indicators at the regional or local levels.

Table 8. M&E systems related to climate change adaptation in Latin America selected for analysis

Country	System	Information source
Systems for monitoring government strategies and plans		
Argentina	National Strategy on Climate Change – Goals and Indicators for Adaptation Measures (ENCC-ARG)	Secretaría de Ambiente y Desarrollo Sustentable de la Nación (2013)
Brazil	Health Sector Plan for Climate Change Mitigation and Adaptation (PSS)	Ministério da Saúde (Brasil) (2013)
Chile	Mid-term evaluation of National Plan of Action on Climate Change (2008-2012) (PANCC)	Obreque (2011)
Colombia	Plan 4C Cartagena de Indias Competitive and Compatible with the Climate (Plan 4C)	Alcaldía Cartagena, MADS, INVEMAR, CDKN, & C. Comercio Cartagena (2014)
Honduras	Indicators of Climate Change with a Socioeconomic Approach (ENCC-HND)	UNAH & IHCIT (2014)
Mexico	Indicators for the Monitoring and Evaluation of the Adaptation to Climate Change (IACC)	Zorrilla & Altamirano (2014)
Mexico	Measurement, Reporting, and Verification of the Special Climate Change Program (PECC I y II)	CICC (2012), Gobierno de la República de México (2014)
Panama	Action Plan for the implementation of National Climate Change Policy (PNCC)	ANAM (n.d.)
Evaluations of programmes and projects		
Bolivia	Institutional Analysis on Adaptation to Climate Change (ARIA)	Flores et al. (2010)
Bolivia	Mid-term Evaluation of the Programme for Agricultural Sustainable Development (PROAGRO)	Kronik, Dockweiler, & Christoplos (2013)
Peru	Programme of Adaptation to Climate Change (PACC)	PACC (2011, 2012), MINAM & COSUDE (2013)

Table 9. Sectors and issues considered with more emphasis on the M&E systems for adaptation to climate change in Latin America selected for analysis

Sectors or topic of emphasis	Strategies and plans								Programmes and projects		
	ENCC-ARG	PSS	PANCC	Plan C4	ENCC -HND	IACC	PECC I & II	PNCC	ARIA	PROAGRO	PACC
Public health	x	x	x		X	x	x	Transversal			
Agriculture and food security	x		x		X	x	x			x	X
Fishing			x			x	x				
Water and environment	x		x	x	x	x	x			x	x
Risk management	x				x	x	x				x
Transport and communications			x			x	x				
Housing and urban development	x		x	x		x	x				
Energy, industry and services	x		x		x	x	x				
Policies and institutional frameworks			x			x		x	x	x	x
Civil organisation									x	x	x

- Government agencies are the main target audience for M&E systems throughout each of the experiences, even though the programme and project assessments also aim to influence the decisions of international cooperation agencies and NGOs. In all cases, the results are disseminated through technical reports or academic publications.
- Only some assessments of projects and programmes identified indicators from the perspective of the users (a bottom-up approach). However, some systems – the ENCC in Argentina and the Special Climate Change Program in its successive phases (PECC I and II) in Mexico – have used or planned consultative processes for this purpose.
- There is no evidence that any of the systems themselves have been evaluated, so the limited lessons on design and implementation come from assessments of the programmes and projects.

5.1 Conceptual Frameworks used for M&E Systems in Latin America

The logical framework approach (described in Section 3.1.2) to establish indicators of outputs, outcomes and impacts over different periods is the most widely used of the systems in the region that were reviewed, although these systems do not necessarily develop indicators for all levels (as discussed in the next section). However there are two projects that use other frameworks:

- The Agricultural Development Programme in Bolivia used the Outcome Mapping approach (described in Section 3.1.7) as a tool to define capacity-building indicators and used the RISE (Response-Inducing Sustainability Evaluation) approach to define impact indicators for farming families (Kronik et al., 2013). RISE is a methodology originally designed by the Swiss College of Agriculture to assess the sustainability of farms using a range of economic, social and environmental indicators. In its current version it uses ten indicators, each calculated using four to seven variables and defined based on its relevance, consistency, transparency and cost, among other criteria. The ten indicators

are: land use, animal production, flow of nutrients, water use, energy and climate, biodiversity and crop protection, working conditions, quality of life, economic viability, and farm management. RISE has always been applied at the farm level through research work with students (School of Agricultural Forest and Food Sciences, 2013).

- The Rapid Institutional Response for Adaptation method (ARIA) is based on the National Adaptive Capacity (NAC) framework, a methodology developed by the World Resources Institute to evaluate the institutions responsible for adaptation to climate change. The framework defines five institutional functions for adaptation: assessment, prioritisation, coordination, information management, and climate risk management (Dixit et al. 2012) (Table 10). The NAC framework can be used to develop indicators to monitor national adaptation programmes and to identify institutional weaknesses that need strengthening. In the case of Bolivia, it was used to assess good practices in implementing policies related to climate change adaptation (Foti et al. 2011).

Table 10. Institutional functions for adaptation, proposed by the National Adaptive Capacity Framework

Function	Description
Assessment	Adaptation requires that assessments be repeated over time, including assessments of a country's vulnerability, the impacts of climate change, adaptation practices and the sensitivity of development activities to these impacts.
Prioritisation	Assigning priorities at the national level to areas, sectors or populations must take into account the fact that climate impacts will be more severe in some places and that certain populations will be more vulnerable than others. Effective prioritisation involves the participation of a wide range of stakeholders, public transparency, and reviewing and adjusting priorities as circumstances change. Countries can define a wide range of values and criteria during the prioritisation process.
Coordination	Adaptation requires action by different actors at multiple levels both within and outside the government in order to avoid duplication of effort and create economies of scale in responding to the challenges. Coordination can start with the establishment of relations and exchanges of information and awareness, and then move towards managing joint decision-making and action. It can be horizontal (e.g. among ministries), vertical (e.g. among national, global and sub-national actors), or among stakeholders (e.g. between government and the private sector).
Information management	This entails the collection, analysis and dissemination of information to support adaptation activities. Relevant information may vary across sectors, countries and the impacts of climate change, but at the least, it should cover climate variables, the state of natural and human systems, and existing coping strategies. Good information management will ensure that the information is useful and accessible to stakeholders. It can also involve awareness-raising or capacity-building for stakeholders to use the information for general adaptation.
Climate risk management	The majority of countries face specific climate risks. Climate risk management examines the institutional capacities needed to address those risks. This requires identifying specific risks, evaluating the range of options for addressing them, and selecting and implementing measures to reduce risks. Countries typically apply risk management based on priority sectors.

Summarised from Dixit et al. 2012, p. 15

5.2 Types of Indicators used in M&E systems in Latin America

The indicators used in the M&E systems for adaptation in Latin America cover several fields related to climatic, biophysical and social processes (unplanned processes), the results of planned adaptation actions, and the quality of the adaptation processes (institutional scope for assessment). In most cases, the indicators are organised by production sectors or are not classified.

The analysis of all the indicators using complementary logic (see Text Box 2) makes it possible to identify the following:

- As in the global experiences reviewed, the largest proportion (49%) of indicators refers to attaining **products** (outputs). These outputs fall into five areas: i) research and development; ii) education, training and communication; iii) identifying priorities for adaptation and planning; iv) the creation or strengthening of organisations (mainly public) and coordination among them; and v) the development or modification of public policies and their instruments. These are considered outputs because the indicators refer to the development and delivery of goods and services, regardless of changes in the capabilities of people and organisations or changes to the environment or infrastructure (Table 11).
- A much lower proportion (14%) focuses on **results** (outcomes). These outcomes correspond to: i) 'hard' adaptation measurement outcomes, aimed at reducing sensitivity or exposure to climate change and climate vulnerability, which involve real changes – albeit emerging ones – in the proportion of the exposed population, production models and use of natural resources, infrastructure design or adjustments, and the state of the environment; and ii) 'soft' adaptation measurement outcomes aimed at improving the responsiveness of society to threats and impacts, which involve real changes in the perception of climate change and climate variability, the implementation of monitoring and information systems, and the location of technical resources in at-risk sites or sectors.
- An even smaller proportion (9%) focuses on **inputs** (incomes). These indicators relate to committed financial and human resources.
- The total of the above indicators (incomes, outputs and outcomes) refers to the group of indicators of planned actions. Just over a quarter of the indicators (28%) are focused on threats, exposure, impacts and sensitivity to climate change (regarding contextual conditions).

Table 11. Number of indicators assigned to different aspects of the adaptation process in the Latin American M&E systems analysed

Logic model of intervention	Elements of vulnerability due to climate change and climate variability	Strategies and plans								Programmes and projects			Total
		ENCC-ARG	PSS	PANCC	Plan C4	ENCC -HND	IACC	PECC I & II	PNCC	ARIA	PROAGRO	PACC	
Mitigation actions	Threats	2				10			4				16
Impacts	Exposure		1		1	1	2						5
	Impacts	3	6		3	8	23						43
	Sensitivity	17			1	8	8					8	42
	Contextual conditions	*11*			*1*	*2*	*5*					*6*	*25*
Outcomes	*Sensitivity reduction measures*	*6*				*6*	*3*					*2*	*17*
	Adaptive capacity	1	8		4	2	3	5	1			2	26
Outputs		14		27	6	2	6	41	16	16		27	155
Research and development		*11*		*20*	*1*	*1*	*3*	*19*	*4*	*7*		*3*	*69*
Education, training and communication		*1*		*3*	*2*			*3*	*3*	*2*		*7*	*21*
Identifying priorities and planning				*2*				*10*	*4*	*2*		*5*	*23*
Strengthening and coordinating organisations				*2*	*2*	*1*	*2*	*7*	*5*	*3*		*6*	*28*
Policies and norms		*2*			*1*		*1*	*2*		*2*		*6*	*14*
Inputs (human and financial resources)		5	1	1	2	2	3	3	3			8	28
	Indicator totals	**42**	**16**	**28**	**17**	**33**	**45**	**49**	**24**	**16**	**nd**	**45**	**315**

Notes: This review does not include indicators associated with measurements of Greenhouse Gas Effects or mitigation actions. The classification has been made by the authors. The PROAGRO assessment does not include references to all indicators, but it is included in this document in order to record the lessons learned in the process of monitoring and evaluation and the approach used.

Box 3. Types of indicators for M&E systems and their relationship to adaptation processes

For the purposes of this analysis, we empirically classify the indicators of the systems reviewed based on two complementary logics: the sequence of a logical intervention model (described in Section 3.1.2), and the IPCC framework to characterise vulnerability (IPCC 2014). This classification is based on the proposal put forth by Hammill et al. (2014) using an extensive review of adaptation experiences at the global level.

We believe that the indicators that justify the relevance of adaptation actions and demonstrate their positive outcomes and impacts are associated with:

- **climate threats** (e.g. increased frequency and intensity of floods), indicating the evolution of a climate context in which adaptation strategies should respond.
- **climate impacts**: indicating the current effects of the threats (e.g. % of homes affected by flooding). Their reduction is the ultimate goal of adaptation to climate change.
- **exposure to climate hazards**: indicating what proportion of the population and their resources could potentially be affected by climate threats (e.g. % of houses in areas at risk of flooding).
- **society and resource sensitivity**: indicating a society's conditions and the resources that affect its responses to changes in climate (e.g. % families with Unmet Basic Needs or % of arable land without access to irrigation).
- **adaptive capacity**: indicating a society's capacity to meet climate change and climate variability threats, respond to the consequences, or – in rare cases – to take advantage of the positive consequences.

Most measures of 'hard' adaptation point to decreasing sensitivity by adapting production systems and use of resources, infrastructure and ecological restoration. Other measures of 'hard' adaptation aim to decrease exposure (e.g. housing relocation) (Barton, 2009). Consequently, depending on how these indicators are expressed, they can point to characteristics of the context or the impact of adaptation processes.

Most measures of 'soft' adaptation are aimed at enhancing adaptive capacity, that is, the population's awareness of climate processes, the operation of monitoring and information systems, the dissemination of measures to address emergencies, and the allocation of technical resources in the most at-risk places.

We evaluate other indicators for monitoring compliance with planned outputs from adaptation initiatives and committed resources. These output indicators are evaluated because they refer to the production and delivery of goods and services, without necessitating evidence of changes in the capabilities of people and their organisations or in the environment or infrastructure. The review of regional experiences focuses on these outputs and resources:

- research and development
- education, training and communication
- identification of priorities and planning
- formulation or adapting policies and instruments, intersectoral coordination mechanisms and platforms to share information and come to agreements
- technical personnel and budget allocation

Information about products and resources to implement adaptation actions helps to follow up on the institutional commitments and to verify that attention is being directed to the country's priorities.

- Finally, 28% of the indicators focus on the threats, exposure and impacts of climate change and climate variability, as well as the contextual conditions that define the society's sensitivity and the sensitivity of its resources. These indicators are clearly delimited when strategies and plans refer to a sector (PSS in Brazil) or a geographical area (PC4 in Colombia). In cases where plans or strategies are at the national level, they can sometimes cover very specific aspects (health, agriculture and biodiversity in the ENCC in Argentina and Honduras) or more sectors (urban areas and infrastructure, coastal and marine areas, education, water, energy and transport in the IACC in Mexico). A positive aspect of the definition of threat indicators is the use of indices that translate climate observations (e.g. average temperature and precipitation) into information that links changes in weather patterns. This is probably most useful for identifying priorities, such as concentration and precipitation deficit indexes and the ratio and per capita availability of water. The ENCC in Honduras provides good examples in this regard.
- Few monitoring systems organise their indicators based on the categories of threat, exposure, potential impacts, awareness and adaptive capacity. Most are based on a cause and effect logic. It is clear that some strategies and plans do not prioritise these indicators, even though they are systematically reported through other mechanisms such as in the CMNUCC's national communications (but in any case, it would be advisable to mention them explicitly).
- Obviously the proportion of efforts devoted to each one of these aspects is not constant among the different experiences. It is clear that several strategies and plans place a greater focus on impacts and outcomes, such as the PSS in Brazil, the ENCCs in Argentina and Honduras or the IACC in Mexico. This is probably in order to define a "north" in the adaptation process. On the other hand, the programmes and projects and the strategy and plan performance evaluations (PECC in Mexico and PANCC in Chile) are more focused on achieving outputs.
- What is not always obvious is the correspondence between the issues addressed by the indicators at the different levels within the same system. For example, in some cases, climate change impacts are defined at the agricultural level, whereas in the case of urban infrastructure, a more relevant focus uses indicators of exposure.
- The majority of systems use quantitative indicators almost exclusively.

5.3 Identification and Selection of Indicators

Several experiences mention the importance of making an inventory based on the M&E efforts carried out in the country. This inventory would include indicators or data related to the different aspects of the adaptation in order to capitalise on the efforts and experiences that already exist and to avoid duplication of effort.

Another important aspect is to have clear and agreed-upon criteria for the identification and selection of indicators. Some experiences evaluated a long list, while others merely mention their complementarity in a logical chain. A summary of criteria is presented in Table 12.

The ARIA (Flores et al. 2010) framework refers to the importance of including indicators of exposure and climate change impacts, as well as broad participation and transparency in the identification and selection of indicators. Its recommendations stress the importance of an inventory of M&E efforts related to adaptation to climate change including sub-national initiatives, and of the inventory and selection being carried out in a transparent and well-recorded way, involving several stakeholders.

Table 12. Criteria utilised to select indicators from the M&E systems related to climate change adaptation in Latin America

Criteria	Description of desirable characteristics
Relevance and clarity	Contains information relevant to high-level decision-makers, but also to other audiences, given that adaptation to climate change is a topic of interest for different types of users. Users can interpret these criteria without having to be experts. The set contains indicators related to threats, climate impacts, and the adaptation processes that are most important in a country or a system.
Sensitivity	These are sensitive to environmental changes and human activities. Data are taken on pre-established dates for set time periods (ensuring that any changes will be registered, but resources won't be wasted).
Relationship among different CC aspects	This group sheds light on the relationships among the climate change processes, their effects, and the social, economic and environmental conditions.
Cause and effect relationship[5]	This set includes indicators for outputs, outcomes and impacts, logically related. It should include indicators for context, especially concerning the conditions that could prove to be barriers to adaptation. This set allows for the monitoring not just of changes in adaptation, but also in how capacities and conditions are developing and where more efforts are being invested.
Scalable	Data can be disaggregated among different administrative levels (e.g. from the national scale to the municipal scale), and can be associated with geographical information models or systems. The outcomes can be compared among different geographical spaces.
Verifiable	The data are accessible, reliable, and documented following an established protocol. The protocol includes a reference value. Both quantitative and qualitative aspects are considered to be verifiable with a suitable protocol.
Robustness	The protocols are founded on technical and scientific bases.
Replicable	Repeated measurements in similar conditions produce comparable information.
Cost-effective	The indicators are periodically measured by public or private organisations. Otherwise, the data can be obtained at a reasonable cost.

Based on UNAH & IHCIT, 2014; Zorrilla & Altamirano, 2014, MINAM & COSUDE, (2013)

5.4 Description of indicators and baselines

Some systems have developed records or protocols for systematic measurement of the prioritised indicators. Developing these records has been helpful in defining more precisely the resources that would be needed to invest in measurement in cases where an entity is not already in charge of this.

Several systems include a baseline, which, in addition to establishing a level of reference, serves to present the indicator's measurement as should be carried out in future measurements. Some systems define

5 Criteria mentioned by most of the experiences, including monitoring systems for government strategies and plans.

an expected trend in indicator measurements, above all when it corresponds to resources and products (inputs and outputs). This helps to establish goals for different time periods. With the understanding that these goals should not be a straitjacket, defining them can help progress reports on the adaptation and decision-making processes.

Describing the indicators and their baselines is a fundamental step toward the formulation of a monitoring plan that specifies what is to be measured, how it will be measured, who will measure it and how often it will be measured.

A summary of the categories used by the different systems to describe indicators is presented in Table 13.

Table 13. Categories of information for the description of indicators in M&E systems related to climate change adaptation in Latin America

Category	Content
Name	Indicator name
Objective and relevance	Justification for inclusion of the indicator in relation to previously defined priorities and their role in assessing progress with adaptation. It occasionally includes the hypothesis of the impact, i.e., the position of the indicator in an intervention logic. This information should be convincing as to why it is necessary or important to invest resources in measuring this indicator.
Description	Type (quantitative, qualitative or mixed), unit of measurement.
Baseline	Reference measurement.
Goals	Indicator of evolutionary trends or hoped-for goals over different time periods.
Measuring frequency	Dates or periods for measurement according to the changes to be documented.
Measurement scale	Units of analysis (e.g. municipalities, ecosystems, country)
Measurement area	Some indicators are measured for the entire country, while others are only measured for areas of interest (e.g. marine coastal zones or priority ecosystems).
Calculation	Description of the formula and formula components.
Interpretation	Considerations taken to interpret trends. For example, the increase in annual rainfall in a decade may be more related to climate variability than to trends in climate change.
Limitations	Any consideration that it is necessary to specify in order to frame the presentation and interpretation of the measurement and the development of the indicator, such as, for example, the sample intensity.
Data sources	Organisation(s) responsible for generating the indicator or the data for calculating. Specifies whether the indicator is already measured or not and if it is necessary to establish some kind of agreement in order to obtain the data.
Type of source	Describes the instrument that provides the information (census, survey, meteorological stations' newsletters, discussion groups).

Based on Alcaldía de Cartagena de Indias et al., 2014; PACC Perú, 2011, 2012; UNAH & IHCIT, 2014; Zorrilla & Altamirano, (2014)

5.5 Implementation and sustainability of M&E systems

The operation of systems to evaluate progress in government strategies and plans is usually internalised in government or inter-government agencies (e.g. the Ministry of Health in Brazil for PSS, the Inter-institutional Commission on Climate Change in Cartagena de Indias for Plan 4C). However, it was not always possible to find evidence of its implementation. Other systems were implemented by government agencies and had reports presented on their implementation, but they are no longer in operation (e.g. Measurement, Reporting and Verification for the Special Programme on Climate Change in Phases I and II with SERMANAT in Mexico).[6] This is also the case for the M&E systems for projects and programmes, which, by their nature, have a defined period of execution.

The experiences implemented make mention of some important criteria for implementation and sustainability over time. The main recommendations arising from the experiences relate to the use of the system in decision-making and in creating awareness, the institutionalisation of the system, the collection and processing of data, continuous improvements to the system and its flexibility. These recommendations are presented in the following chapter.

6 For a detailed example of measuring, reporting and verification mechanisms, see the PECC I report, which is available on-line (CICC, 2012).

6. Emerging Lessons

This report is one of the earliest to review some of the lessons arising from the developing field of building indicator systems for monitoring and evaluating climate change adaptation at the national level, and then implementing such systems. Based on a review of methods, approaches and experiences for setting up an appropriate indicator system for the monitoring and evaluation of climate change adaptation, the following emerging lessons are suggested as supporting relevant stakeholders in designing and setting up such indicator systems.

On system design

One of the main challenges when designing and implementing an indicator system for M&E is to choose an appropriate set of indicators which focuses on the key issues and information needed for decision-making. To select appropriate indicators for decision-making, the indicators should reflect the context (local or national) and the processes that are to be monitored, while also capturing the progress of these processes. Before selecting indicators through clearly defined and previously agreed upon criteria, consideration should be given as to what would appropriately be relevant for the local contexts, as this can vary considerably even within, for example, a country or municipality. If indicators are not adequately context-specific or described in an understandable way, they may be interpreted in different and confusing ways. To ensure clear understanding for those who will be implementing the indicator system, a hypothesis can be formulated and linked to each of the proposed indicators.

Some experiences rely on the use of a theory of change in order to define a set of indicators, while other experiences use different factors that define climate change vulnerability (exposure, impacts, sensitivity) as a guide. In any case, the set of indicators should establish a clear relationship among the identified interventions, threats, impacts and exposure. This does not require building a logical framework, but rather demonstrating that the prioritisation of actions is actually focusing on a useful priority.

On system implementation

A key lesson of existing indicator systems is that they rely mainly on data from existing systems, and focus on strengthening existing data sets either by adding adaptation or using well-established monitoring systems constructed for other purposes. Examples include the indicators for the Millenium Development Goals (UN), indicators for the Human Development Reports (UNDP) and the National Communications for the UNFCCC. Integrating the indicator system into existing development structures and procedures would, in addition to reducing the work burden, also highlight the fact that adaptation is an integral part of sustainable development. In any case, there must be a clear allocation to an organisation or group of organisations that have a mandate to implement and maintain the system (with adequately trained personnel and other resources to maintain the system and to develop specific reports about adaptation to climate change). Several experiences show how the use of simple manuals and online platforms can facilitate data collection and effectively distribute the effort throughout a number of organisations, including the private sector and civil society.

On the use of the system in decision-making and raising awareness

The systematic inclusion of M&E reports in decision-making spaces involves defining mandates and reporting channels with established authorities, but also knowing the decision-makers' informational needs. On the other hand, the use of M&E system outputs is a great opportunity to develop awareness of

the relevance of climate change and adaptation to climate change among decision-makers from different sectors, such as the government, the private sector and society in general. It is not enough to just report on the goals achieved; rather, it is also necessary to analyse how the context is evolving, how this relates to the success of the interventions, and whether the lines of intervention should be adjusted accordingly.

On system flexibility and adjustments

Measuring progress in adaptation to climate change in terms of *what* and *how* is still an emerging field. Adaptation is a complex process over the long term, one about which we still know very little. There is uncertainty associated with climate change and climate variability, as well as with the contextual conditions. Therefore, the approach to setting up an indicator system for monitoring and evaluating should be flexible and pragmatic in terms of setting goals, defining processes, selecting indicators, finding adequate data, and so forth. Being too strict in one's approach could entail the risk of not being able to fulfil all the requirements and hence never reaching the implementation stage.

It should be emphasised that monitoring and evaluation systems are ongoing processes that need continuous adjustments to changing and growing experiences, capacities and environments. Hence, regular reviews and adjustments are necessary to reflect and incorporate these changes and to maintain and improve the performance of these systems. The use of feedback systems for improvement, or mechanisms such as peer review or independent evaluations to verify the quality of the reports, have proved helpful in this regard. Likewise, it is important to programme spaces to give value to the accumulated experiences in terms of system operation and the delivery of information to different target audiences.

On the participation of different stakeholders and the transparency of the system

As a country-driven process, the involvement of all relevant stakeholders is crucial during the design and implementation stages of an indicator system. The value of involving a wide range of relevant stakeholders is that the country will progress and become stronger in terms of tackling climate change because the process provides an ideal setting for stakeholders that play sufficiently crucial roles in a country's policy and planning processes to become engaged in climate change issues. Having a participatory approach also ensures that different interests are well represented while simultaneously ensuring a political commitment to the indicator systems. Another important consideration for the process is to have mechanisms that guarantee transparency, accountability and capacity-building. The latter is important in terms of resource allocation and commitment during both the development and the implementation of the indicator system.

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	Sector	Intervention	Indicator Type	Indicator	Evaluation Criteria	Data Requirement	Measurement Tool
1	Infrastructure	Construction of dyke for preventing coastal flooding	Process	Design compliance	Implementation/ Compliance	Design Documents	Field evaluation
			Outcome	Cost of investment vs. beneficiaries	Efficiency	Average users for a time period and cost of investment	Project Accounts for total and sample survey for users
			Impact	Increase in number of beneficiaries	Beneficiaries	Number of beneficiaries with and without infrastructure	Sample survey
2	Health	Administration of a vaccine to prevent viral infection	Process	Medical procedure compliance	Implementation/ Compliance	Guidance document	Sample survey
			Outcome	Number of people immunized	Beneficiaries	Number of people administered vaccine	Medical records
			Impact	Increase in average lifespan	Effectiveness	Average age of life span of target population	Field surveys; census records
3	Agriculture	Administration of a new cropping technique	Process	Amount of pesticide administered	Implementation/ Compliance	Guidance document	Soil testing
			Outcome	Increase in yield per unit area	Efficiency	Yield per hectare of baseline and post implementation	Field survey
			Impact	Decrease in number of cases of malnourishment	Effectiveness/ Beneficiaries/ Equity	Number of people incidences of malnourishment in a region	Medical records
4	Forest	Afforestation	Process	Average distance between each plant	Implementation/ Compliance	Distance between two plants	Field survey/remote sensing
			Outcome	Increase in per unit plantation	Efficiency	Plantation density per unit area of baseline and post implementation	Remote sensing
			Impact	Increase in number of beneficiaries	Beneficiaries	Number of beneficiaries receiving spillover benefits adaptation intervention	Sample survey
5	Biodiversity	Conservation zone for endangered plant species	Process	Legal Approval	Feasibility/ Implementation/ Compliance	Appropriate Bare Act / Law	

			Outcome	Increase in number of plant species	Effectiveness	Number of plants before and after the conservation zone formation	Sample survey
			Impact	Contribution to GHG reduction	Sustainability	Per unit CO2 sink	Laboratory test
6	Water	Implementation of a participatory water conversation and supply mechanism	Process	Number of people in the target group willing to participate in the implementation of the intervention	Acceptance	Number of people in the target group willing to participate in the implementation of the intervention	Household survey
			Outcome	Increase in per capita water consumption of people from marginalized group	Equity	Water consumption before and after intervention	Water consumption survey
			Impact	Decrease in number of water borne diseases	Beneficiaries	Number of people affected with water borne diseases before and after intervention	Medical records

Annex 2. Examples of Indicators for the Monitoring and Evaluation of Climate Change Adaptation

Below is a list of indicators for the monitoring and evaluation of climate change activities presented in Sanahuja (2011). The list should be viewed as examples from an almost infinite list of indicators. Indicators are local and case-specific and should always be adjusted according to the effort with which they are associated.

Physical infrastructure and basic services

Construction of a flood shelter and an information and assistance centre to cope with enhanced recurrent floods in major floodplains.

Enhancing the resilience of urban infrastructure and industries to the impacts of climate change.

Providing sustainable drinking water to coastal communities to combat enhanced salinity due to rises in sea level.

Protect and safeguard existing coastal land uses by implementing measures such as sea walls, dykes, beach nourishment and wetland restoration.

Engage in actions that compensate for climate-related changes (e.g. constructing raised homes on piles to accommodate rising sea levels).

Land use

Promoting adaptation to coastal crop agriculture to combat increased salinity.

Adaptation to agricultural systems in areas prone to enhanced flash flooding.

Focuses on governance and territorial management, stressing the relevance of local DRM and the urban dimensions of risk, along with the pivotal role of local authorities.

Design and implement zoning regulations and building codes.

Food security

Enhancing resilience of the food production and security sector to climate change.

Changes in resource use practices

Adaptation to fisheries in areas prone to enhanced flooding through adaptive and diversified fish culture practices.

Promoting adaptation to coastal fisheries through culture of salt-tolerant fish in coastal areas.

Water resources and quality

Targets environmental dimensions of disaster risk management, in particular adaptation to climate change and water resources management.

Reallocation of reservoir yield.

Water conservation and demand management (including metering and price structure).

Expand well fields.

Rainwater harvesting.

Public health

Mapping of eco-zones and changes in vector-borne diseases.

Policy and planning

Mainstreaming adaptation to climate change into policies and programmes in different sectors (focusing on disaster management, water, agriculture, health and industry).

State policies and programmes in the food production and security sector to integrate climate change adaptation priorities.

Increasing awareness

School campaigns.

Other public campaigns.

Information management

Promotion of research on drought, flood and saline-tolerant varieties of crops to facilitate adaptation in future.

Education

Inclusion of climate change adaptation and other issues in the curriculum at secondary and tertiary educational institutions.

Disaster risk reduction

Climate change and adaptation information dissemination to vulnerable communities for emergency preparedness measures and awareness raising on enhanced climatic disasters.

Identifying key actions to be taken at the national and sub-national levels.

Traditional knowledge

Development of eco-specific adaptive knowledge (including indigenous knowledge) on adaptation to climate variability to enhance adaptive capacity for future climate change.

Relocation

Relocate human settlements (homes, roads, etc.) away from areas of potential flooding, allowing the rising sea to advance inland.

Gender issues

Acting on the role of gender in DRR.

Motivational influences in gender analysis.

Demographic issues

Mapping adaptation to climate change in populations which are aging.

Multi-sector holistic efforts

Focus on social development and compensatory measures to reduce vulnerability, identifying concrete tasks for the Ministry of Education, Ministry of Housing and Territorial Zoning, National Environmental Authority and the Ministry of Health, to further DRR through education, land-use planning and vulnerability reduction of critical infrastructure, such as schools and health-care facilities.

Human security

Displaced populations.

Climate change refugees.

Changes in migrants and migrant working.

Increased rural–urban migration.

Increased social unrest over resources.

Economics

Government taking responsibility for developing financial mechanisms to reduce the vulnerability of the portfolio of public investments by introducing DRR considerations into investment planning processes, as well as developing mechanisms for financial protection.

Compensation for flood damage.

Facilitate access to credit.

Insurance

Adequately addressing loss and damage from the impacts of climate change.

Exploring options for insurance and other emergency preparedness measures to cope with enhanced climatic disasters.

Financial sector

Recognizing the reality of climate change and mainstream it into all business processes. This is a decision factor for business planning and strategies, portfolio management, and an individual transaction level.

Developing and supplying products and services for the new markets which will come into being with integrated adaptation, e.g. at the micro-level in developing countries, and for ecological services.

Working with policymakers to realize the transition to integrated adaptation.

Ensuring that contingency plans consider ‘worst case’ disasters.

Social mobilization

Adaptation to climate change involving civil organizations active and functioning.

Framework	Developer or proponent	Description	Resource type/ stepwise guidance	Definition of adaptation effectiveness	Adaptation indicator guidance	Sector relevance	Applicability
Results based monitoring and evaluation		M&E strategy focused on performance and achievement of outputs, outcomes and impacts which use feedback loops to achieve goals	Yes	Compliance with indicators that have dynamic goals. Proactive M&E tool	Open (Outcome Indicators) Mixed	All	Programme level
Robust Decision-Making	Rand Corporation	Decision-making process that identifies future conditions critical for a plan's success without predicting future	Yes	Compliance with conditions critical to a possible future state	Open (Outcome Indicators) Mixed	All	Programme level
Opportunistic impact measurement	GIZ	Impact evaluation framework that measures two states of a system, i.e. with and without the intervention in case of event.	No	Damages avoided	No	All	Programme level
Tracking Adaptation and Measuring Development (TAMD)	IIED	Combination of how widely and how well countries or institutions manage climate risks and how successful adaptation interventions are in reducing climate vulnerability and in keeping development on course	Yes	Compliance with nine suggested indicator categories	Yes	All	Programme national
Outcome Mapping Approach	IDRC	Provides a set of tools to design and gather information on the outcomes, defined as	Yes	Positive behavioural changes in	No	Sectors that need human interaction	Programme level

		behavioural changes		boundary partners			
Logical Framework Approach	USAID	A systematic approach to designing, executing and assessing projects that has objectively verifiable indicators for goals, purpose, activities and outputs in a project. RBM differs from the LFA in its strong commitment to achieving results. The RBM generally leaves inputs out of the picture, and therefore it may miss one of the building blocks of the results chain.	Yes	Compliance with pre-determined objectively verifiable indicators	No	All	Programme level
Objectives Oriented Project Planning (ZOPP)	GTZ	Provides a systematic structure for the identification, planning, and management of projects.	No	Compliance with indicators	No	All	Programme level
Monitoring and Evaluation Framework	UNDP	Provides guidance and builds adaptation capacity to design rigorous initiatives and monitor progress.	No	Broad indicators categories	Yes	Natural resources, food security, water, coastal zones, disaster risk management, health	Programme level

Annex 4. RBM Tracking Tool for Climate Change Adaptation Projects

Based on Global Environment Facility (GEF 2014)

Goal: increase resilience to the adverse impacts of climate change in vulnerable developing countries through both short- and long-term adaptation measures in affected sectors, areas and communities, leading to a reduction of the expected socio-economic losses associated with climate change and variability.						
Indicator	**Unit of measure**	**Baseline**	**Target**	**Mid-term**	**Completion**	**Comments**
Objective 1. Reduce the vulnerability of people, livelihoods, physical assets and natural systems to the adverse effects of climate change						
Indicator 1. Number of direct beneficiaries	number of people					
	% female					
	vulnerability assessment (Yes/No)					
Outcome 1.1 Vulnerability of physical assets and natural systems reduced						
Indicator 2. Type and extent of assets strengthened and/or better managed to withstand the effects of climate change	ha of lands					
	km of coast					
	km of roads					
Outcome 1.2 Livelihoods and sources of income of vulnerable populations diversified and strengthened						
Indicator 3. Population benefiting from the adoption of diversified, climate-resilient livelihood options	number of people					
	% female					
	% of targeted population					
Outcome 1.3 Climate-resilient technologies and practices adopted and scaled up						
Indicator 4. Extent of adoption of climate-resilient technologies/ practices	number of people					
	% female					
	% of targeted population					
	ha of lands					

	% of targeted area					
Objective 2. Strengthen institutional and technical capacities for effective climate change adaptation						
Outcome 2.1 Increased awareness of climate change impacts, vulnerability and adaptation						
Indicator 5. Public awareness activities carried out and population reached	yes/no					
	number of people					
	% female					
Outcome 2.2 Access to improved climate information and early-warning systems enhanced at regional, national, sub-national and local levels						
Indicator 6. Risk and vulnerability assessments, and other relevant scientific and technical assessments carried out and updated	number of relevant assessments/ knowledge products					
Indicator 7. Number of people/ geographical area with access to improved climate information services	number of people					
	% female					
	% of targeted area (e.g. % of country's total area)					
Indicator 8. Number of people/ geographical area with access to improved, climate-related early-warning information	number of people					
	% female					
	% of targeted area (e.g. % of country's total area)					
Outcome 2.3 Institutional and technical capacities and human skills strengthened to identify, prioritize, implement, monitor and evaluate adaptation strategies and measures						

Indicator 9. Number of people trained to identify, prioritize, implement, monitor and evaluate adaptation strategies and measures	number of people					
	% female					
Indicator 10. Capacities of regional, national and sub-national institutions to identify, prioritize, implement, monitor and evaluate adaptation strategies and measures	Number of institutions					
Objective 3. Integrate climate change adaptation into relevant policies, plans and associated processes						
Outcome 3.1 Institutional arrangements to lead, coordinate and support the integration of climate change adaptation into relevant policies, plans and associated processes established and strengthened						
Indicator 11. Institutional arrangements to lead, coordinate and support the integration of climate change adaptation into relevant policies, plans and associated processes	Number of institutions					
Outcome 3.2 Policies, plans and associated processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures						
Indicator 12. Regional, national and sector-wide policies, plans and processes developed and strengthened to identify, prioritize and integrate	number of policies/ plans/ processes					

adaptation strategies and measures						
Indicator 13. Sub-national plans and processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures	number of policies/ plans/ processes					
Outcome 3.3 Systems and frameworks for the continuous monitoring, reporting and review of adaptation established and strengthened						
Indicator 14. Countries with systems and frameworks for the continuous monitoring, reporting and review of adaptation	number of countries					

Annex 5. Templates for M&E of Climate Change Adaptation

This annex provides 3 examples of how M&E frameworks can be structured.

Template 1:

This template is based on the ´Objective Oriented Planning (ZOPP)´ framework. ZOPP entails formulating a Project Planning Matrix (PPM), a sample of which is presented in this template. Typical components of the PPM are project details, technical specification, resource use, time lines and their subsequent status if the project is going on. Some binary variables for compliance (Yes/No; 0/1) etc. can also be introduced to track progress. The template presented here is using outcome indicators and is tracking the progress of an ongoing project. This template can be modified to include indicators capturing the impact of the programme if evaluation has to be carried out at the end of the programme. Similarly, just with the objectives, targets and resource plans it can be a pre-project plan which can also be used to effectively use this for programme implementation.

Template 2:

This template has a focus on process indicators. When interventions seek compliance, and compliance with standard operating practices can be crucial for the success of the intervention, then this template can be used. This entails enlisting all the processes involved in the intervention. For each of the compliance factor, an indicator can be designed. Typically they can be binary variables where whether the procedure was followed appropriately or not is checked. In some cases the processes may involve attaining certain value over a time period in which case the indicators can be actual numbers or are based on some observations where qualitative indicators can be used.

Template 3:

UNDP's handbook on Handbook on Planning, Monitoring and Evaluating for Development Results illustrates this template for M&E. This template is descriptive and elaborates each of the components like variables used, baseline, targets etc. in detail. The template highlights what needs to be monitored in a programme. The details in the template facilitate participation and also provide an overview to those not involved in the intervention on the deliverables of the intervention and those responsible for it. This can also be adapted for local conditions at programme, portfolio and regional levels. (Source: http://web.undp.org/evaluation/handbook/ch3-2.html)

Template 1

Project Name	Introduction of Micro Irrigation Scheme in district A of Tanzania						
Project Lead	ABC	**Reporting Period**	2014-2015	*Programme Target*	66%	*Annual Target*	33%
Location	District A - Tanzania	**Project Start**	01 April 2012	*Actual Coverage*	66%	*Year to Date Actual*	33%
Sector	Sustainable Agriculture	**Project End**	31 March 2015	*% of LoP Target*	100%	*% of Annual Target*	100%

						Project Baseline		Reporting Period 1						Reporting Period 2					
								T1			Implementation Budget utlization			T2			Implementation Budget utlization		
Indicator	*Support Person*	*Data Required*	*Information Collection Method*	*Unit of Measurement*	*Estimated Monitoring Cost*	*Date*	*Value*	*A*	*T*	*V*	*A*	*T*	*V*	*A*	*T*	*V*	*A*	*T*	*V*
Objective:	Increase farm land productivity of rice by introducing micro irrigation scheme																		
Outcome : Efficiency & Effectiveness																			
Indicator 1.1: Output per unit input cost	*AB*	*Unit Input Cost*	Field Survey	USD	500 USD	March 2012	300				600	500	-100						
		Unit Output	Field Survey	Tonnes per hectare	500 USD	March 2012	400				400	500	100						
Indicator 1.2: Farm Yield	*BC*	*Production*	Field Survey	Tonnes	300	March 2012	1600	2500	3000	-500									
		Farm Area	Secondary Study from Project Document	Hectare	0	March 2012		200			0	0	0						
Outcome 2: Beneficiaries (Coverage)																			
Indicator 2.1:Proportion of Farm Land Covered	CD	Farm Area of Implementation	Secondary Study from Project Document	Hectare	0	March 2012	100	750	1000	-250									
		Total Farm Area	Secondary Study from District Development Plan	Hectare	0	March 2012													
Indicator 2.2																			
Indicator 2.3																			
Outcome n																			
Indicator n																			

Project Resources	
Implementors	5
Evaluators	3

Project Outreach	**Till 2015**	**Target**
Farm Area Covered	1000 hectare	1200 hectate
Households Covered	700	700

Key

Core Indicators	**A**	Actual	**V**	Variation
Other Indicators	**T**	Target		

Template 2

	Investigator	Start Time Period	End Time Period	Time Required	Actual Time	Variance	Budget Required	Actual Budget	Variance	Compliance Criteria	Compliance (0-No, 1-Yes)	Report	Disseminate	Feedback
Process 1	ABC	T1	T3	2 T	2T	0	1 B	3 B	- 2 B	I1: Description	1	0	0	0
										I2: Description	1	0	0	0
										I3: Description	1	0	0	0
										I4: Description	1	0	0	1
Process 2	DEF	T2	T4	2 T	2T	0	2 B	2 B	0	I5: Description	0	1	1	1
										I6: Description	1	0	0	0
										I7: Description	1	0	0	1
Process n	XYZ	T3	T5	2T	3T	- T	2 B	2 B	0	I8: Description	0	1	1	1
										I9: Description	0	1	1	1
										I0: Description	0	1	1	1

Template 3

Source: http://web.undp.org/evaluation/handbook/ch3-2.html

Expected Results (Outcomes & Outputs)	Indicators (with Baselines & Indicative Targets) and Other Key Areas to Monitor	M&E Event with Data Collection Methods	Time or Schedule and Frequency	Responsibilities	Means of Verification: Data Source and Type	Resources	Risks

This report reviews lessons arising from the developing field of building indicator systems for monitoring and evaluating climate change adaptation at the national level, as well as experiences from implementing such systems. International good practices for the design and implementation of national monitoring and evaluation (M&E) for climate change adaptation are identified, analysed and compared. In addition, the report provides an introduction to context of, and key terminology for, M&E and climate change adaptation. It reviews approaches to M&E and discusses the application and relevance of existing frameworks for M&E globally, and particularly in Latin America. The report is a product of technical assistance being delivered in Colombia by the Climate Technology Centre and Network (CTCN) and in close partnership with national stakeholders. The objective of this technical assistance is to support the development of the Colombian national monitoring system to strengthen climate change adaptation.

The **Climate Technology Centre and Network (CTCN)** promotes the accelerated development and transfer of climate technologies for energy-efficient, low-carbon and climate-resilient development. As the operational arm of the United Nations Framework Convention on Climate Change Technology Mechanism, the Climate Technology Centre is hosted and managed by the United Nations Environment Programme in collaboration with the United Nations Industrial Development Organization and supported by 11 partner institutions around the world. The Centre utilizes the expertise of these institutions, as well as an international Network of civil society, private sector, and research institutions, to deliver technical assistance and capacity building at the request of developing countries.

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