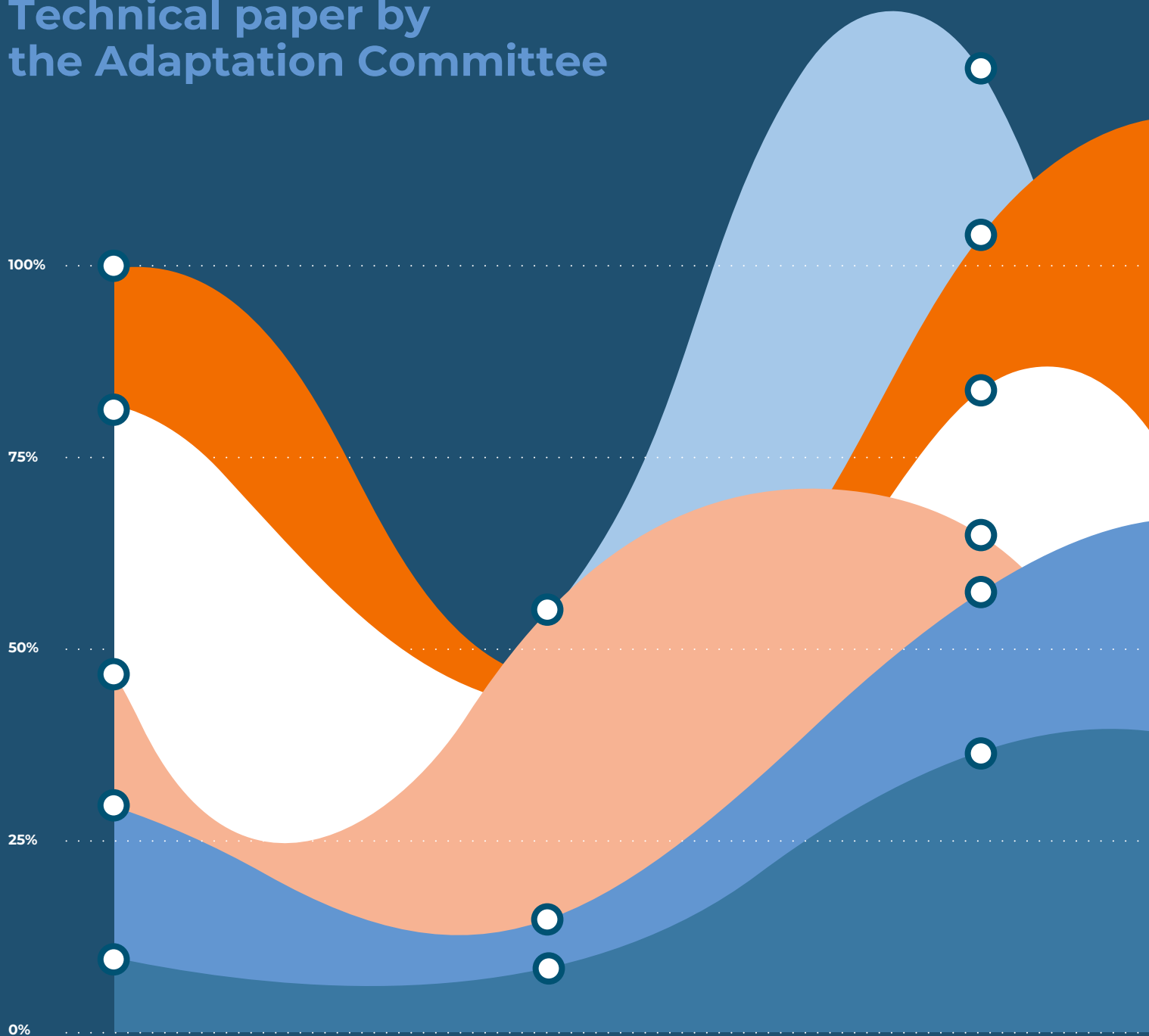


# Monitoring and evaluation of adaptation at the national and subnational levels:

Technical paper by  
the Adaptation Committee



United Nations  
Climate Change

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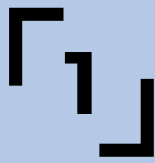
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# ABBREVIATIONS AND ACRONYMS

AC	Adaptation Committee
GIZ	German Agency for International Cooperation
ICAT	Initiative for Climate Action Transparency
IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
JNAP2	Tonga's Joint National Action Plan 2 on Climate Change and Disaster Risk Management 2018-2028
KPI	key performance indicator
M&E	monitoring and evaluation
MEL	monitoring, evaluation and learning
MERL	monitoring, evaluation, reporting, and learning
MRV	monitoring, reporting and verification
NAP	national adaptation plan
NDC	nationally determined contribution
SDGs	Sustainable Development Goals
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change



# INTRODUCTION AND BACKGROUND

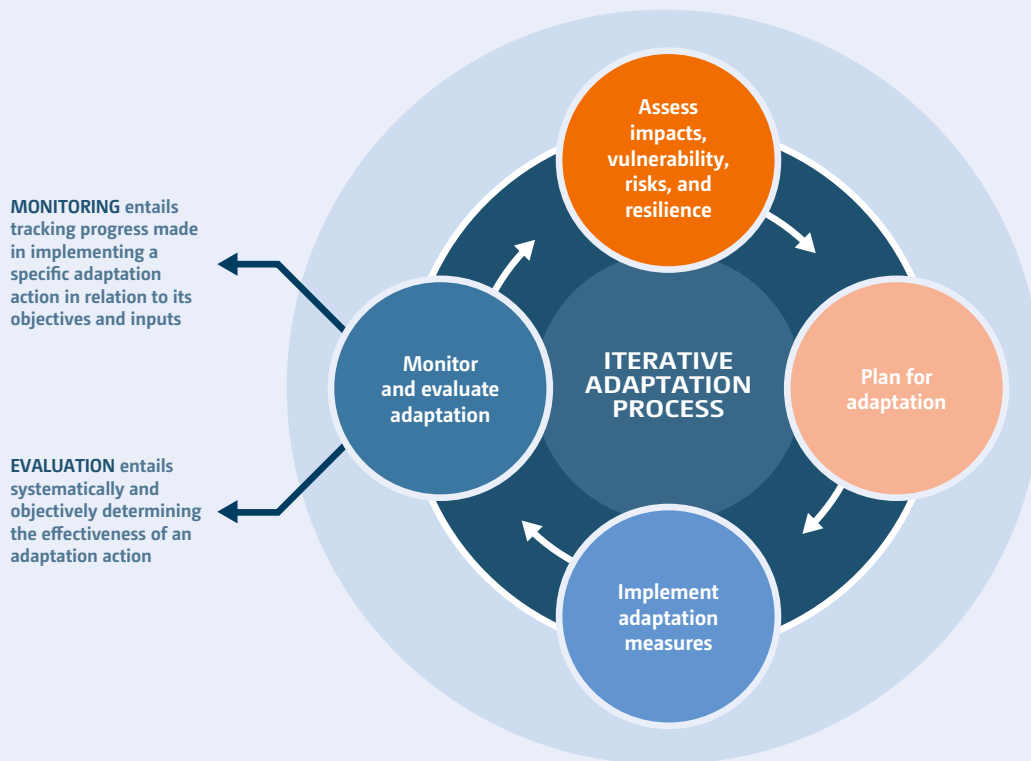
Monitoring and evaluation (M&E) is a critical component of adapting to climate change. The Paris Agreement underscores its importance, emphasizing that “Each party shall, as appropriate, engage in adaptation planning processes and the implementation of actions, including the development or enhancement of relevant plans, policies and/or contributions, which may include... Monitoring and evaluating and learning from adaptation plans, policies, programmes and actions.”<sup>1</sup> The IPCC (2022) similarly places a strong emphasis on the importance of M&E, noting that it “is a key prerequisite for successful iterative risk management and achieving effective and just adaptation outcomes at local to global levels.”

M&E represents one of four steps in the iterative adaptation policy cycle (see figure 1). It consists of two distinct but complementary actions. First, monitoring entails tracking “progress made in implementing a specific adaptation action in relation to its objectives and inputs” (AC, 2014). By contrast, evaluation aims at “systematically and objectively determining the effectiveness of an adaptation action” (AC, 2014). This encompasses dimensions such as efficiency and equity. In combination, M&E enables adaptation planners and practitioners

to judge the extent to which adaptation actions are effective in achieving their objectives. It further enables continual learning from and adjustments to the implementation of adaptation. As such, M&E is often alternatively abbreviated as ‘MEL,’ which stands for monitoring, evaluation, and learning. M&E thus “plays a central, enabling role” (IPCC, 2022) in adaptation as an iterative process that improves over time as the nature of climate risks and the effectiveness of adaptation interventions are better understood.

Risks of maladaptation underscore the urgency of effective and sustainable M&E of adaptation. Such risks imply that adaptation actions may not only fail to reduce vulnerability, but can in some cases exacerbate it. Eriksen et al. (2021) warn, for example, that adaptation interventions may reinforce or redistribute vulnerability, or generate new sources of vulnerability. What’s more, the most marginalized are often those who see their vulnerability compounded in these scenarios. Evidence suggests that this is sometimes taking place even in interventions where there are explicit commitments to target the most vulnerable or goals to foster inclusion and participation (Eriksen et al., 2021).

<sup>1</sup> Article 7, paragraph 9 of the Paris Agreement.

**FIGURE 1.** Monitoring and evaluation in the iterative adaptation process

Source: Adapted from Adaptation Committee, 2019.

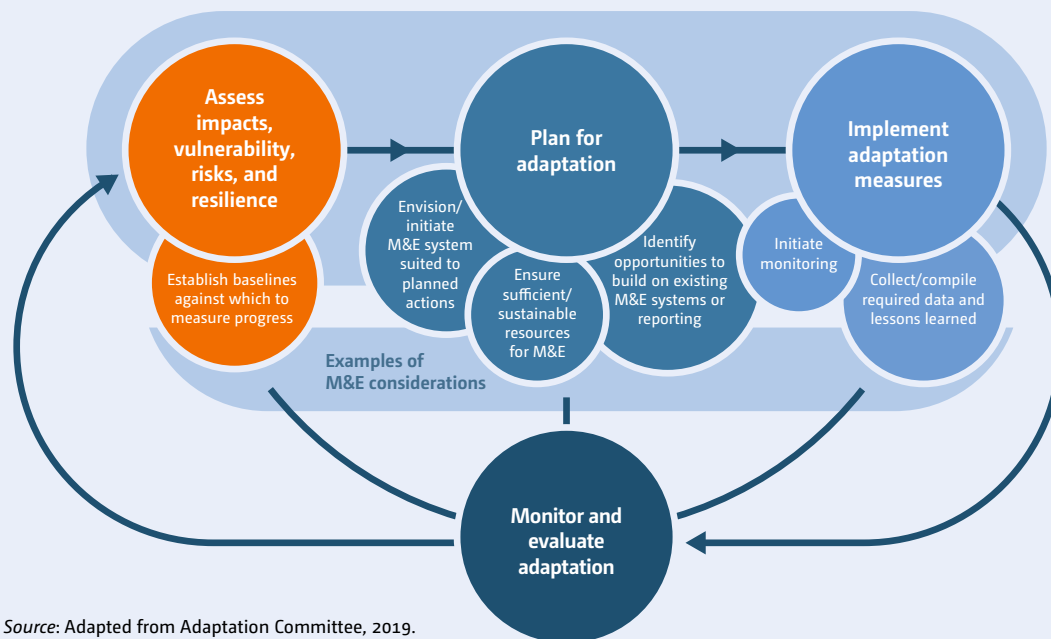
M&E is portrayed as the last step in the adaptation cycle following the logic of the process; it is impossible to monitor or evaluate something that has not yet been planned or implemented following an assessment of the relevant impacts, risks, vulnerabilities, and resilience. This does not imply, however, that M&E can be an afterthought or component of adaptation that only comes into play once the other steps have concluded. On the contrary, M&E should be a core consideration throughout each step of the process (see figure 2).

Assessing impacts, vulnerability, risks, and resilience, for example, can set the stage for M&E by establishing baselines against which to measure progress following implementation of adaptation measures. Adaptation planning, meanwhile, provides the opportunity to envision and initiate an M&E system suitable for the set of actions included in the plan. An important consideration at the planning stage is also how to ensure sufficient and sustainable resources to support monitoring, evaluation, and learning over the time horizon during which the planned

activities are expected to deliver their adaptation benefits. What's more, it is worth reflecting at this stage whether and how the M&E that will be undertaken can complement and/or build upon other relevant M&E systems or requirements, such as systems at other levels of government or requirements set by donors and funds, where applicable. Finally, implementation should signal the beginning of the monitoring half of the M&E equation. It is also important that data and lessons learned needed to enable the evaluation half of the equation are diligently collected and compiled throughout the implementation stage.

When the cycle repeats, it is then critical that the findings and lessons learned from M&E activities inform each stage of the process moving forward. Thus, despite appearing at the end of the adaptation cycle for the sake of simplicity, M&E is not an isolated, final stage; instead, all other stages should be pursued with a view to enabling effective M&E, and M&E should inform all future stages of the iterative adaptation process.

**FIGURE 2.** Monitoring and evaluation considerations at all steps of the iterative adaptation process



Source: Adapted from Adaptation Committee, 2019.

### 1.1 About this publication

This is a publication of the Adaptation Committee (AC). Established in 2010, the Adaptation Committee is the United Nations' premier expert body addressing climate change adaptation. Its goal is to promote the implementation of enhanced action on adaptation in a coherent manner under the Convention and Paris Agreement.

The AC has long prioritized work on M&E of adaptation. Indeed, M&E featured on the first-ever workplan of the AC and has remained a continuous theme in its events and publications ever since. This paper represents the latest addition to this extensive and evolving portfolio of work. It builds upon and complements recent elements of this work, such as the 2020/2021 Adaptation Forum on *M&E systems at the national and subnational level – Measuring progress and impacts and communicating results<sup>2</sup>* and the AC's technical paper on *Approaches to reviewing the overall progress made in achieving the global goal on adaptation* (Adaptation Committee, 2021).

This work has progressed amid growing momentum on adaptation worldwide, and a growing recognition of the need to better assess and understand the impacts and results of adaptation actions undertaken. Moreover, the AC's work has played a key role in contributing to this momentum, by producing various technical analyses and tools that shed light on effective M&E methodologies, best practices, lessons learned, and challenges in climate adaptation at different levels of governance, promoting coherence in implementing and assessing adaptation efforts worldwide. For example, the AC's technical paper on the global goal on adaptation yielded a range of insights into the various options for assessing adaptation progress internationally and globally, helping to lay the foundation for the Glasgow-Sharm el-Sheikh work programme on the global goal on adaptation.

This paper contributes to enhancing knowledge and practice on adaptation M&E at the national and subnational level. It also provides useful insights for policy makers, practitioners, researchers, and other stakeholders who are interested in advancing this field.

<sup>2</sup> For more information, see here [https://unfccc.int/event/unfccc-ac-m\\_and\\_e\\_systems](https://unfccc.int/event/unfccc-ac-m_and_e_systems)



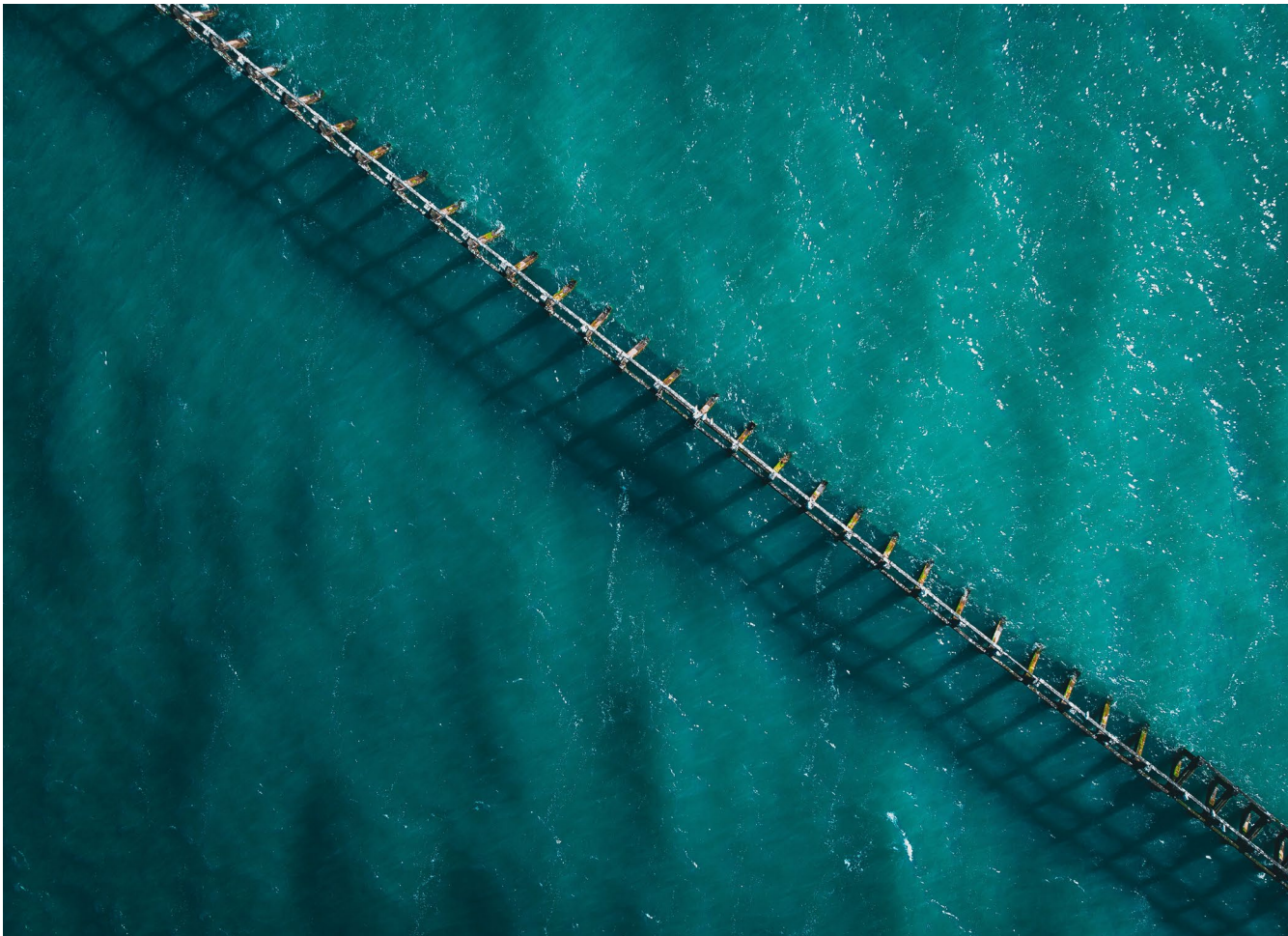
## 1.2 Scope and structure of the paper

This technical paper explores the current landscape of M&E for climate change adaptation at the national and subnational level. Chapter 2 begins by discussing the range of methodological and conceptual issues at the heart of adaptation M&E. In doing so, it seeks to elucidate why the practice of M&E in the realm of adaptation remains nascent despite widespread acknowledgement that it is essential to effectively reducing vulnerability and building resilience to the impacts of climate change. Subsequently, chapters 3 and 4 examine the development and application of M&E systems for adaptation at the national and subnational level, respectively. Both chapters contain case studies that illustrate the various ways in which different jurisdictions are making progress on M&E despite the associated challenges. Both chapters also distil the enduring barriers faced in taking these steps forward, as well as the opportunities and good practices demonstrated by the case

studies and related literature. Chapter 5 then discusses the key findings and insights from the preceding chapters. Finally, chapter 6 offers concluding remarks and outlines potential next steps for the AC.

Overall, the paper explores the following questions:

- a. What steps do governments take to develop and apply their M&E systems for adaptation, and what challenges do they encounter?
- b. What opportunities exist to address these challenges and enhance the implementation of adaptation actions at the national and subnational levels through M&E?
- c. How do governments at the national and subnational level institutionalize learning in their M&E systems? How do governments define and measure progress in adaptation efforts, including the identification of relevant indicators?



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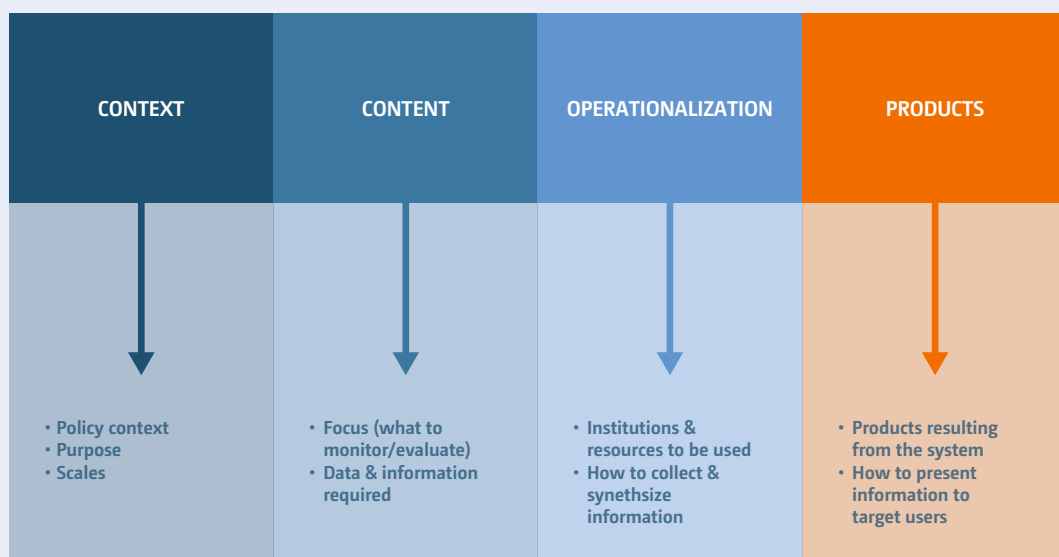
# 「2」 APPROACHES AND CHALLENGES IN MONITORING AND EVALUATING ADAPTATION

## 2.1 Approaches and methodologies

Developing and applying M&E systems for adaptation generally proceeds along four key steps or “building blocks” (Price-Kelly et al., 2015). First is understanding the context in which the M&E system will be applied, including the policy context, the purpose of the system, and the scale of application and aggregation. The next step is

identifying the content of the system, including what will be monitored and evaluated. Third, it’s important to decide on how to operationalize the system – for example, which institutions and resources will be used and how data will be collected and synthesized. The fourth and final building block focuses on the products that will be generated through the system and how best to present the results. See figure 3.

**FIGURE 3.** Four building blocks of developing and applying monitoring and evaluation systems



Source: Based on Price-Kelly et al. 2015.



Abbreviations and acronyms

Introduction and background

Approaches and challenges in monitoring and evaluating adaptation

Development and application of monitoring and evaluation systems at the national level

Development and application of monitoring and evaluation systems at the subnational level

Discussion

Conclusion and next steps



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While these steps are broadly applicable to governments in the process of setting up their M&E systems, the M&E approaches that are designed and applied as a result differ significantly. The Adaptation M&E Navigator, developed by GIZ, identifies a wide range of approaches that are suited to different M&E purposes.<sup>3</sup> For example, monitoring the extent to which adaptation has been mainstreamed into planning can be undertaken through qualitative, interview-based assessments or quantitative or qualitative indicators. By contrast, M&E undertaken with the objective of assessing the results of adaptation actions may be better served by approaches such as qualitative assessments involving beneficiaries; theory of change approaches with indicators; repeated vulnerability assessments; impact

evaluations; or assessments of avoided economic losses and health benefits.

Even among governments who pursue similar approaches, however, there are significant differences in the operational details of systems that are set up. For example, of countries who have adopted indicator-based frameworks to support their national M&E efforts, the number of indicators selected varies widely, from less than 15 to over 100 (Adaptation Committee, 2021). The ways in which data and information are gathered (e.g. through surveys, workshops, interviews, document reviews, etc.) and presented (e.g. through qualitative descriptions, numerical scores, traffic light systems, statistics etc.) also differ between systems and contexts.

<sup>3</sup> See: <https://www.adaptationcommunity.net/monitoring-evaluation/multi-level-adaptation-me/>



## 2.2 Methodological and conceptual challenges in monitoring and evaluating adaptation

Despite widespread recognition of its important role in effective adaptation, and the range of possible approaches, the science behind and practice of M&E remains immature. This is in part due to a range of challenges that complicate M&E of adaptation (Adaptation Committee, 2021). These include methodological challenges such as attributing results to specific adaptation interventions or working around the uncertainties and shifting baselines of climate change hazards. This also encompasses difficulties stemming from the dynamic relationship between adaptation and mitigation, as adaptation effectiveness will depend to some extent upon the ambition and success of mitigation efforts (IPCC, 2022). Because adaptation is considered a cyclical and iterative process, as displayed in figure 1 above, there is also generally “no clear measure or benchmark” – in other words, no finish line – that can mark the success of adaptation (Bours, McGinn, and Pringle, 2014). The multi-scalar nature of adaptation – that is, it involves responding to global climate change dynamics at local to regional levels, and thus involves multiple scales and sectors – adds additional layers of difficulty (Bours, McGinn, and Pringle, 2014). Different sectors and areas will require different adaptation interventions and therefore rely on different measures of success, often rendering comparison, aggregation, or disaggregation either impractical or unhelpful.

There are also empirical challenges (e.g. lack of data or databases) and conceptual challenges (e.g. lack of consensus on definitions of key terms) that further complicate M&E. In terms of the former, challenges with collecting good climate data are particularly acute for many developing countries – and fragile or conflict-affected States even more so – where “[t]he cost of collecting data, limited resources and

the number of pressing development priorities” often stand in the way of the development of national databases and M&E efforts (OECD, 2015). In a similar vein, capacity constraints and resource limitations can also significantly impede the development of M&E systems for adaptation and their maintenance over time (AC, 2014). Conceptual challenges, by contrast, can be illustrated by the difficulty of finding agreement on terms that are central to M&E, including “successful” adaptation. This is because there is no such single definition (Dilling et al., 2019) and existing definitions may fail to reach consensus among adaptation experts (Bolaños, Scheffran, and Costa, 2022). Even if expert consensus was reached, a universally applicable definition may remain elusive. This is because risk tolerances and perspectives differ between people and evolve over time, and power asymmetries can influence both what gets measured and how it is measured (Dilling et al., 2019).

These challenges vary depending on the nature of the M&E being undertaken. For example, while M&E of adaptation outcomes is fundamental to understanding the progress and effectiveness of adaptation, most current monitoring focuses instead on planning and implementation (IPCC, 2022). These aspects tend to be easier to track and quantify than the outcomes or impacts of adaptation actions; it is relatively simple to count, for example, the number of policies adopted, staff trained, or mangroves planted, but less straightforward to gauge the extent to which vulnerability was reduced or resilience increased as compared to a baseline or a counterfactual in which a given adaptation intervention was not implemented. In addition, there is growing emphasis on transformational adaptation and its advantages over incremental approaches, but there is so far no consensus and “little knowledge” on how transformational change in the area of adaptation can be defined, measured, and assessed (Gregorowski and Bours, 2022).



# 3

# DEVELOPMENT AND APPLICATION OF MONITORING AND EVALUATION SYSTEMS AT THE NATIONAL LEVEL

## 3.1 Information from national reports under the UNFCCC

Countries are increasingly initiating and progressing in the development and application of M&E systems. The IPCC's Working Group II, in its contribution to the Sixth Assessment Report, found that M&E of adaptation increased at both the national and subnational levels since its Fifth Assessment Report (IPCC, 2022). Similarly, comparing the status of M&E for national adaptation plans (NAPs) between 2017 and 2021, Leiter (2021) found a 40 per cent increase in the number of countries in the process of developing or applying M&E systems.

Parties also appear to be increasingly defining quantitative time-bound targets to facilitate the tracking and assessment of their progress on adaptation. These targets relate to a wide variety of sectors. This trend is especially noticeable in nationally determined contributions (NDCs); the 2021 NDC synthesis report by the UNFCCC secretariat noted that new and updated NDCs contain more of these targets, as compared with the more qualitative and open-ended objectives that were prevalent in previous NDCs.<sup>4</sup> Examples include restoring 150,000 ha of land through agroforestry by 2050; increasing water storage capacity from 596 million to 3,779 million m<sup>3</sup> by 2030; ensuring that 40 per cent of health institutions implement adaptation approaches by 2030; and increasing the number of modern weather stations from 325 to 806 in 2018–2030.

Despite this progress, however, the challenges described in chapter 2 above continue to represent a formidable roadblock in the development and application of adaptation M&E systems worldwide. According to the UNEP Adaptation Gap Report, only around one quarter of country Parties to the UNFCCC had an M&E framework in place as at August 2021 (UNEP, 2021). This was among the weakest links in adequate and effective adaptation planning globally, according to the criteria used in the assessment. The IPCC (2022) has also concluded that the application of adaptation M&E is “still at an early stage in most countries and underutilized as a way to assess adaptation outcomes at longer timeframes.” Further, the progress that is being made is by no means irreversible. For some countries who were early movers in their efforts to establish national M&E systems, their progress has stalled since 2015 (Leiter, 2021).

In their NAPs, NDCs, and adaptation communications, many countries make reference to the topic of adaptation M&E. While a significant portion of these describe proposed or potential M&E frameworks that can be used to monitor their adaptation actions, the extent to which these frameworks have been developed or operationalized is often unclear.

Countries ascribe importance to M&E of adaptation, and prioritize its pursuit, for a variety of reasons. M&E is prioritized because

<sup>4</sup> See document FCCC/PA/CMA/2021/8/Rev.1, para. 156, and FCCC/PA/CMA/2021/8/Add.1, table 2.



of its function in, for example, tracking progress towards climate resilient development, understanding the impacts of observed and future climate change impacts on specific demographics, capturing lessons learned to be incorporated in subsequent adaptation planning and implementation, ensuring accountability in delivering on adaptation commitments, and more. Monitoring and reporting on domestic adaptation outcomes has also been prioritized to accurately reflect contributions to achieving the Paris Agreement's global goal on adaptation.<sup>5</sup>

Further, in the development of adaptation M&E systems, countries frequently prioritized key themes. This includes gender sensitivity; various countries recognized the importance of gender-disaggregated data and gender impact assessments to understand how the impacts of climate change and adaptation efforts manifest differently by gender. A second recurrent priority is sectoral vulnerability assessments

and indicators to enable targeted and efficient planning, tracking, and assessment of adaptation interventions. Aligning monitoring plans for NAPs with existing sectoral priorities, and incorporating sectoral and subnational targets, was highlighted as an important consideration. In addition, aligning domestic adaptation M&E initiatives with the Paris Agreement's enhanced transparency framework and its associated reporting mechanisms was also prioritized. Synergies in progress monitoring between the Paris Agreement and other related international frameworks, including the 2030 Agenda for Sustainable Development and the Sendai Framework for Disaster Risk Reduction, were identified as a key entry point for promoting policy coherence and enhancing efficiency. Finally, another priority related to public participation and stakeholder engagement in adaptation monitoring; in some cases, this encompasses efforts to promote a bottom-up approach led by communities and local authorities in decision-making and M&E.



<sup>5</sup> Established in Article 7.1 of the Paris Agreement, the global goal on adaptation aims at “enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal” of limiting warming to “well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C.” In 2021, a two-year Glasgow-Sharm el-Sheikh work programme on the global goal on adaptation was established in order to better understand, conceptualize and ultimately achieve this goal.



Additionally, countries point to numerous challenges associated with the operationalization of national M&E systems for adaptation. One of the most common challenges relates to weak data management capabilities, which hinder efforts to collect, store, and use data for the purposes of M&E. This encompasses aspects such as lack of software, modelling skills, quantitative national datasets, and telemetry systems for measurement, as well as fragmented monitoring and reporting systems related to climate change. There are also several areas where countries highlight that relevant data is absent or inadequate, including on disability and youth participation, climate education, food security, epidemiology, climate finance, water and sanitation conditions, as well as in certain areas of the country or levels of analysis (e.g. provincial level). Another frequently cited difficulty pertains to institutional coordination, including vertical and horizontal coordination and collaboration. Effective M&E is an inherently collaborative process that requires the engagement of various stakeholders, including different ministries and administrative departments, as well as non-government stakeholders. In a related vein, limited human resources, as well as inadequate means of implementation – including financial, capacity-building, and technology transfer support – are also recurrent challenges.

The next sub-chapter showcases five case studies demonstrating how various countries are navigating the challenges associated with adaptation M&E to establish and implement national systems.

## 3.2 Case studies

### 3.2.1 Panama

To track progress towards adaptation planning and implementation and ensure the success of adaptation interventions, Panama established its Adaptation Monitoring and Evaluation System in 2021 through Executive Decree No. 135.<sup>6</sup> This executive decree stipulates that an indicator set will be used for monitoring and evaluating adaptation efforts and outcomes throughout the country. In developing its national M&E system,

Panama sought to base the system on the Paris Agreement and the associated rules agreed to guide its implementation. For example, the M&E system was developed in parallel to the process to update the country's NDC. This was intended to enable the indicators developed under the system to monitor and evaluate the adaptation measures included in the NDC.

The development of the M&E system took place through nine steps:

- a. Formation of thematic teams: Ten thematic teams – corresponding to the sectors identified in Panama's update of its NDC – were formed.
- b. Review of available information: An exhaustive bibliographic review of documents from various international organizations related to adaptation indicators was conducted.
- c. Goal setting: Goals were identified using the Green Climate Fund's Theory of Change approach.<sup>7</sup>
- d. Technical meetings: Meetings were held to analyze which indicators are especially important to measure change and progress. These meetings included staff from the Ministry of Environment that are responsible for environmental information, as well as from the Inter-institutional Environment System.
- e. Indicator selection: Selection took place through stages, first at the international level and then at the national level, based on the guidelines of the Comisión Económica para América Latina y el Caribe.
- f. Indicator prioritization: Eighty-one indicators were reviewed and prioritized based on the availability of national data and the existence of methodology documents. Thirty-three were then separated preliminarily, and twenty-one were ultimately selected based on their significance and synergy with state entities in the country.

<sup>6</sup> Based on a case study submitted to the AC by the Ministry of Environment of Panama in May 2022.

<sup>7</sup> See section B.2 of the GCF Programming Manual (GCF, 2020).



- g. Construction of methodological sheets: Sheets contained a brief description of and general information related to the indicator.
- h. Indicator validation: Validation of the sheets referred to in the previous steps was undertaken through meetings with relevant entities.
- i. Institutional agreements: Agreements with governing institutions were elaborated or updated to enable the data transfer required for each indicator.

Panama is moving forward with the application of its M&E system through the project titled “Technical Support to Strengthen the Monitoring and Evaluation System of Adaptation to Climate Change in Panama.” This project, which was completed in February 2023, was undertaken within the framework of the Initiative for Climate Action Transparency (ICAT), a multi-stakeholder partnership that provides tailored support, practical tools and methodologies to countries in order to build robust transparency frameworks for climate action.<sup>8</sup> Panama’s ICAT project sought to strengthen the adaptation M&E system, gather loss and damage-related indicators, and strengthen institutional and inter-institutional capacities related to the use and reporting of the M&E system.<sup>9</sup>

One of the deliverables of the ICAT project was a manual for the use of adaptation indicators in Panama.<sup>10</sup> For each of the 21 indicators prioritized for the M&E system, the manual presents information on the indicator in general (e.g. unit of measurement, formula, scope of the indicator, the indicator formula, etc.), and on data collection, data systematization, and the measurement of progress.

Of the 21 indicators, 2 measure exposure to climate change; 5 measure sensitivity to climate change; and 14 track adaptive capacity at the

national level (Government of Panama, 2023). Examples of indicators include: number of beneficiaries of adaptation projects; percentage of chambers of commerce and industry and business associations using climate change and/or adaptation information; number and value of physical assets that become more resilient to climate variability and change; municipalities with local regulations that consider climate change adaptation and results of vulnerability assessments; percentage of farmers and hectares with crops insured against losses due to extreme and slow-onset weather events; and percentage of people permanently displaced from their homes as a result of floods, droughts or sea level rise.

The information collected through the M&E system will be available on the National Climate Transparency Platform (Government of Panama, 2023).

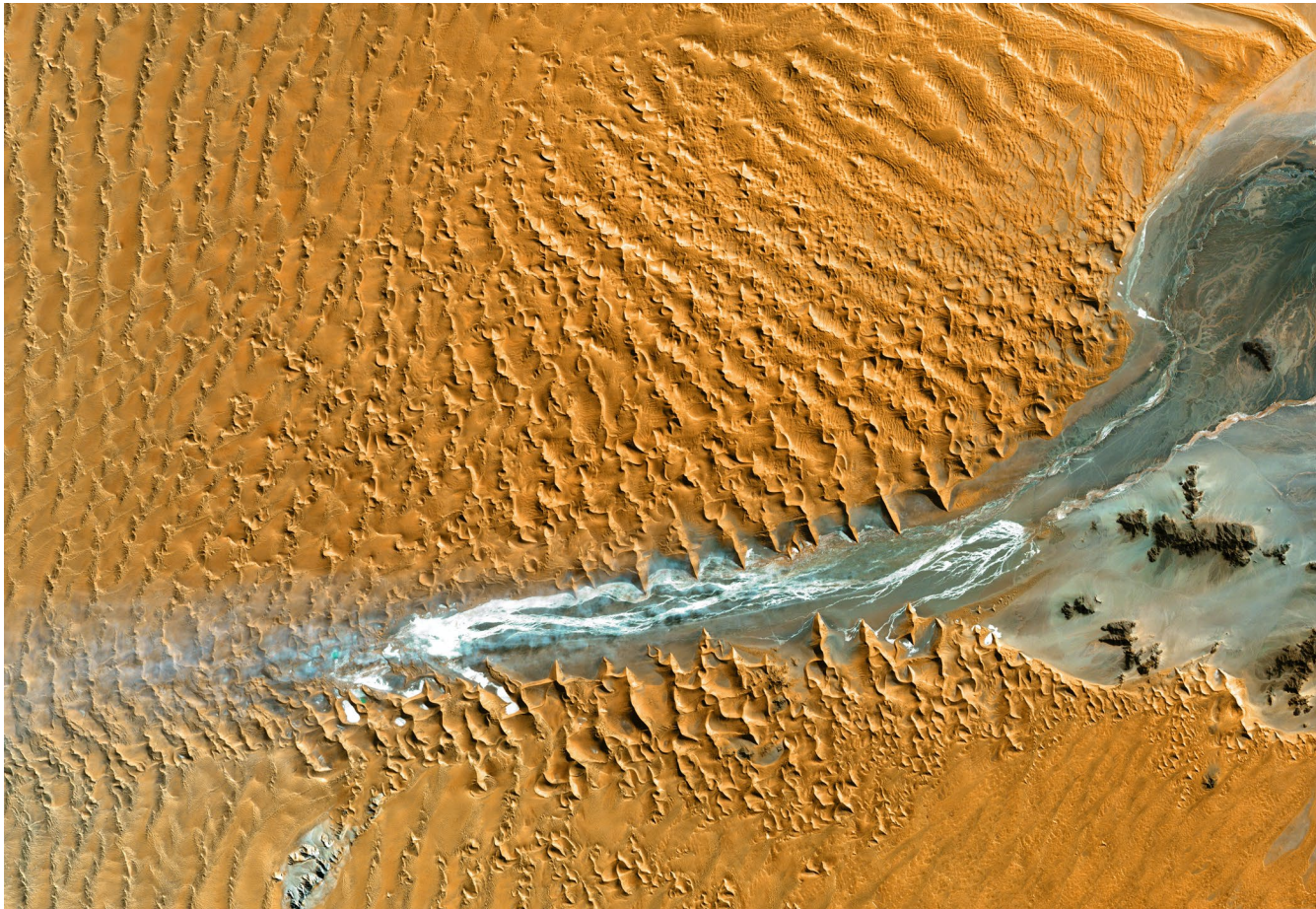
Lessons learned thus far through the development and application of Panama’s adaptation M&E system include:

- a. M&E systems for adaptation require capacity-building and awareness-raising of the importance of continuous and standardized data gathering to monitor adaptation progress and implementation. They also require a data storage structure and data quality standards.
- b. It is critical to have sufficient human resources with appropriate skills and expertise for the follow-up and monitoring of indicators.
- c. Institutional support is necessary for data collection, and effective communication among institutions is necessary to update and improve indicators.
- d. M&E of adaptation is a long-term effort that requires continual strengthening.

8 For more information, see <https://climateactiontransparency.org/>

9 See <https://climateactiontransparency.org/country/panama/>

10 See <https://climateactiontransparency.org/wp-content/uploads/2023/02/2.1.1-Metodologia-de-Perdidas-y-Danos-1.pdf>



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### 3.2.2 Burkina Faso

Burkina Faso published its NAP in 2015. The NAP included a chapter on M&E, which elaborated on the importance of M&E; the resources and capacities required for M&E; the methodological approach to be undertaken and associated M&E mechanism; the process for revising and updating the NAP; and the use of independent external evaluations. In 2021, the country published an evaluation of the NAP from 2015 to 2020, corresponding to the first five-year implementation cycle of the NAP (Government of Burkina Faso, 2021). The evaluation was carried out by the Government of Burkina Faso with technical and financial support provided by the NAP Global Network through the International Institute for Sustainable Development (IISD).

Burkina Faso's first evaluation was guided by the following objectives: developing and testing an approach to producing the

first implementation report for the NAP; re-engaging actors responsible for NAP implementation in the country; identifying key lessons from the first phase of NAP implementation; and demonstrating the NAP implementation status and making associated recommendations for future NAP development and implementation. To help decide on an approach to the evaluation, an experience-sharing session took place to illustrate NAP assessment methodologies being deployed in other countries. Ultimately, Burkina Faso settled on the following approach for undertaking the evaluation:

- a. Establishing a team to evaluate the NAP, including a Technical Working Group composed of stakeholders from the relevant sectors.
- b. Taking a participatory and inclusive approach including various ministerial departments, the private sector, civil society actors, and more.

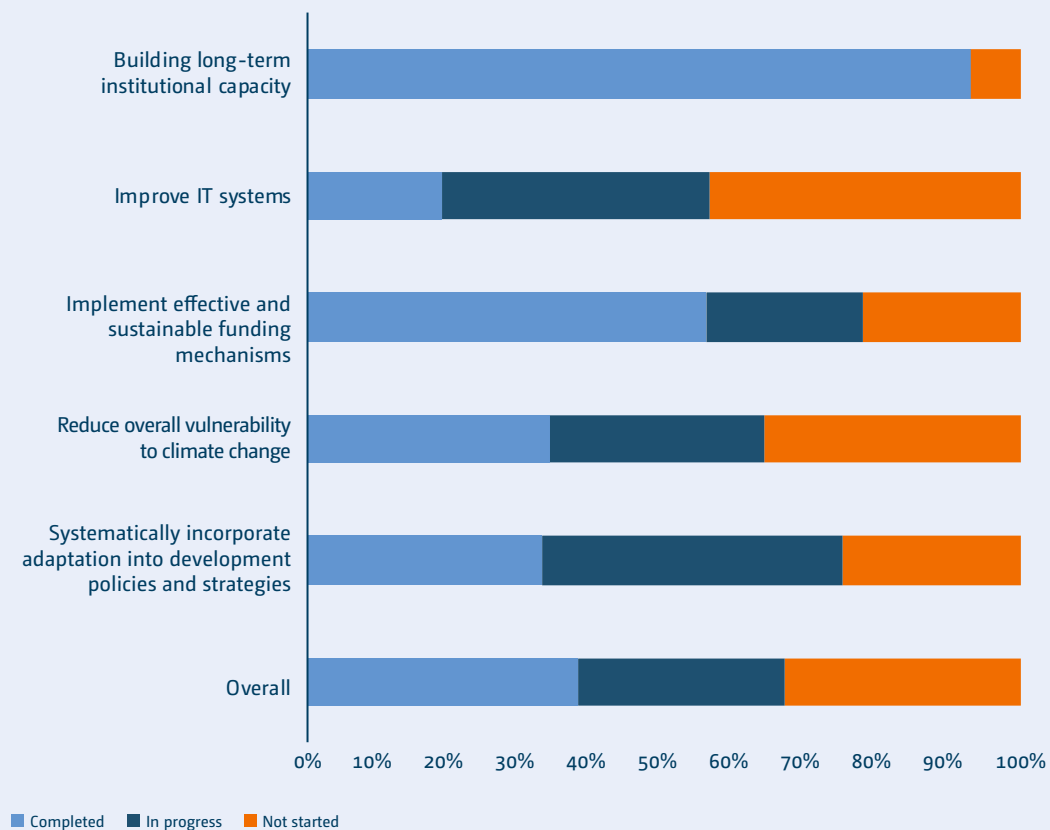


- c. Combining qualitative and quantitative approaches to evaluation.
- d. Conducting the evaluation along the NAP's five strategic areas.
- e. Developing and validating the M&E forms for the actions in the NAP.
- f. Undertaking a data collection phase – including sharing by sectoral actors – followed by data processing and analysis.
- g. Pre-validating and validating the NAP evaluation report.

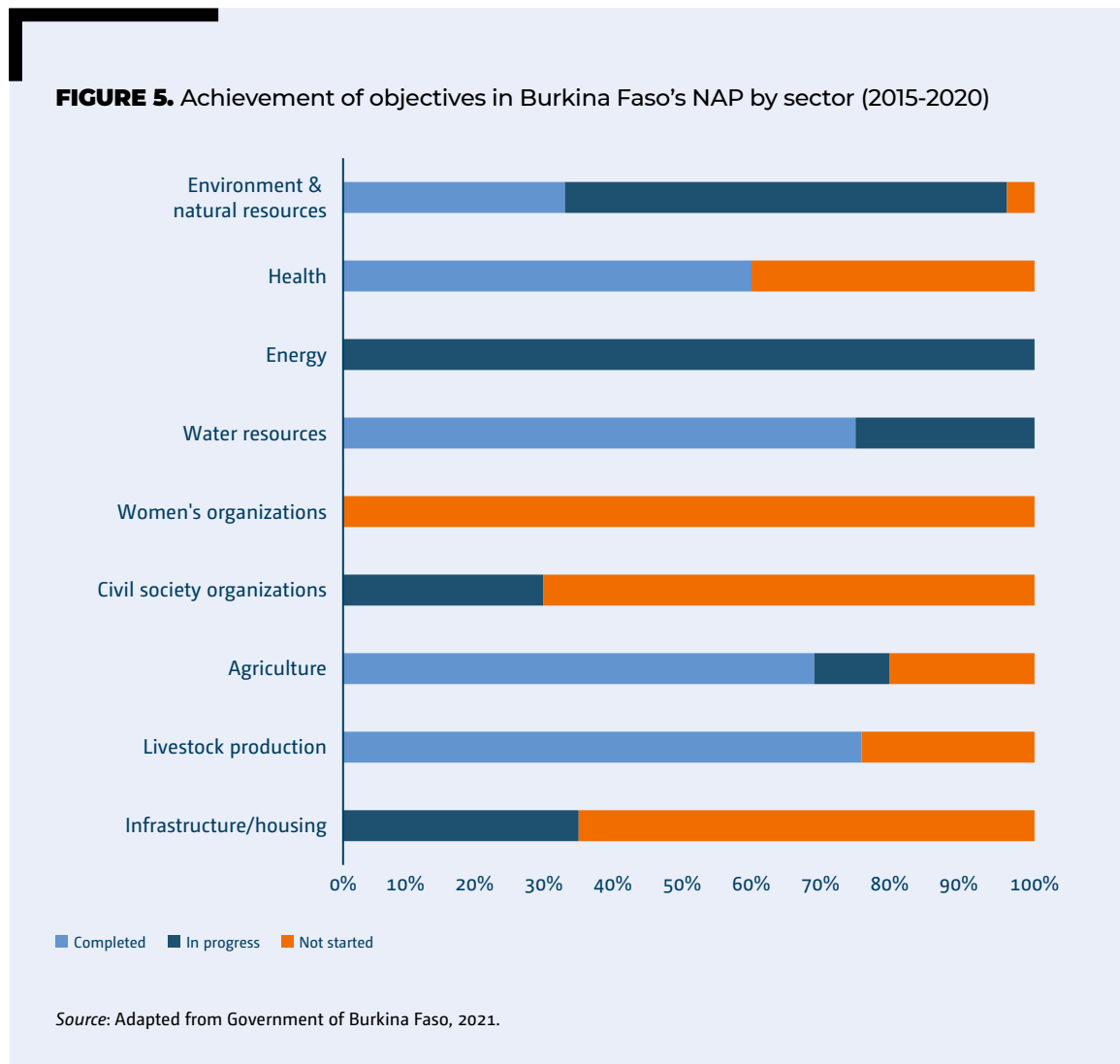
For each of the NAP's strategic focus areas, the evaluation assessed the extent to which objectives were achieved as well as the "level of

physical completion" of the actions in the NAP. It also noted key strengths and weaknesses and examined how much gender was considered in the NAP implementation. This evaluation yielded clear snapshots of progress by both strategic objective and sector (see figures 4 and 5 respectively). Confronted with the discrepancies in achievement rates across priority areas and sectors, the evaluation report interrogated the reasons behind these differences, such as the efforts made by the relevant ministerial department, varying levels of institutional leadership, and technical support received from partners. In addition, this also yielded key figures summarizing the outputs of the NAP implementation, such as the tonnes of improved seed provided to producers at subsidized prices (in the agriculture sector) or the number of dams rehabilitated (in the water resources sector).

**FIGURE 4.** Achievement of objectives in Burkina Faso's NAP by strategic priority area (2015-2020)



Source: Adapted from Government of Burkina Faso, 2021.



The evaluation thus focused on assessing the extent to which the measures contained in the NAP have been implemented, rather than evaluating the ultimate impacts of implemented measures in terms of vulnerability reduced, resilience built or adaptive capacity improved. Notably, the process through which the evaluation took place deviated from the process originally outlined in the NAP, which was an M&E methodology that not only examined implementation and outcomes, but also monitored the impact of NAP implementation (Government of Burkina Faso, 2015). One of the lessons learned highlighted in the evaluation report concerned the failure to operationalize this M&E mechanism. While shifting focus to implementation levels is a clear constraint, it nonetheless testifies to the value of undertaking M&E efforts even in the absence

of the capacity to undertake a comprehensive evaluation or to execute the M&E process as originally envisioned in the NAP or other planning document. Indeed, the NAP itself outlined the significant human, technical, and financial resources that would be required for its M&E. In addition, the NAP specified that “a simple and practical monitoring and evaluation methodology should be put in place” until the associated technical resources are developed and put in place. Some of the recommendations appearing in the evaluation report aimed at improving M&E of the NAP; specifically, the report recommended to (1) clearly define actions and associated short-, medium-, and long-term targets and (2) strengthen the skills of the NAP focal points to facilitate monitoring and reporting of their respective sectors’ actions in relation to the NAP.



As described in section 1 above, a core function of M&E is enabling learning and informing the process of iteratively improving adaptation efforts. As such, the results of M&E must be readily accessible to a wide range of stakeholders. Burkina Faso's NAP evaluation report strives to ensure that this is the case by outlining a strategy for disseminating the report to different groups, ranging from decision-makers (e.g. summarizing the evaluation report) to the public (e.g. designing leaflets on the key findings and translating these into local languages).

### 3.2.3 Finland

Finland has published a series of evaluation reports over the years as part of its efforts to assess its national adaptation plans and strategies. Evaluations of its 2005 National Adaptation Strategy were published in 2009 and in 2013; these evaluations assessed the level of implementation of the strategy at the mid-term and end of its period, respectively (GIZ, 2017).

More recently, a mid-term evaluation of the National Climate Change Adaptation Plan 2022, published in 2014, was undertaken (Mäkinen et al., 2020). This evaluation was carried out through the following steps:

- a. **Government self-evaluation:** This stage consisted of the collection of monitoring data on the implementation of the adaptation plan, as well as group interviews with government representatives from different administrative branches and sectors, and from local and regional governments.
- b. **Stakeholder participation:** This stage consisted of a national online survey targeted at non-government stakeholders in 11 sectors, as well as five regional discussion events.
- c. **Analysis and reporting of evaluation findings:** The data was analyzed and incorporated into a draft report, which was reviewed by Finland's monitoring group on climate change adaptation.

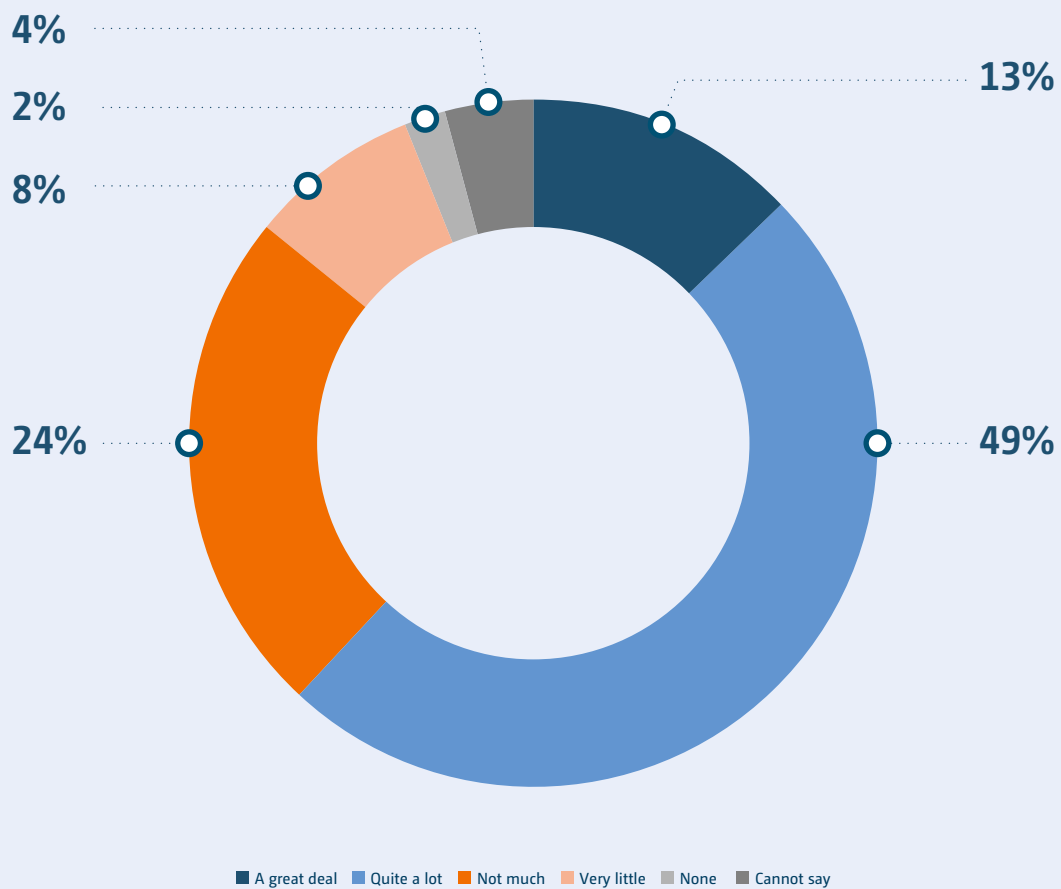


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The mid-term evaluation was underpinned by a set of criteria relating to the implementation process (institutional capacities, barriers, stakeholder participation, collaboration of actors, and lessons learned) and the effectiveness (effectiveness, efficiency, relevance, coherence, and side effects) of the adaptation plan. These criteria were assessed for each of the three main objectives of the adaptation plan, with the report offering qualitative descriptions of the findings for each. Quantitative data from the stakeholder survey was also presented in the evaluation report, illustrating findings on questions such

as the type of support that would most promote adaptation work; the extent to which the NAP is known by the respondents of the survey/their sectors; the amount of information on weather and climate risks respondents' organizations have relevant to their sector; awareness of the need for adaptation action in respondents' organizations; etc. See an example in figure 6 below. In practice, however, the evaluation focused more on the implementation process due to limited resources and information sources, as well as the fact that the plan had only been implemented for a short period at the time of the evaluation.

**FIGURE 6.** Amount of information organizations responding to Finland's stakeholder survey have on weather and climate risks relevant to their sectors (in total for all sectors; N=430)



Source: Mäkinen et al., 2020.



A national, cross-sectoral monitoring group on adaptation was established to follow and evaluate implementation of the adaptation plan. It met regularly and strove to raise awareness among different stakeholders in order to promote adaptation and was also tasked with ensuring the M&E of adaptation.

Notably, the mid-term evaluation makes clear that the M&E framework that had been envisioned for the NAP has not yet been realized. Indeed, it was reported in 2017 that Finland was in the process of developing an M&E system to accompany its plan, which was expected to be finalized in 2018 and implemented as of 2019 (GIZ, 2017). A monitoring framework for adaptation was developed from 2015-2017, with a corresponding set of indicators made public in 2017; the mid-term evaluation noted however that “no headway has been made in the introduction of the indicators and organisation of monitoring at the practical level” (Mäkinen et al., 2020). Despite the indicators having been elaborated, operationalizing the system proved difficult and the annual progress reports envisioned by the NAP were not yet produced at the time of the mid-term evaluation. At the same time, the process of participating in the mid-term evaluation did encourage some branches of government to monitor the implementation of their adaptation-related work. As at 2022, work was ongoing with the national Climate Change Panel to identify suitable indicators, especially in the health and water services sectors (Government of Finland, 2022).

Based on the findings of the mid-term evaluation, the resulting report also contained a range of recommendations for promoting the effective implementation of the plan as well as for developing the M&E process for the plan. The latter included ensuring the continuous monitoring of the adaptation plan, including through annual progress reports; focusing on measuring effectiveness when preparing for and conducting the final evaluation of the adaptation plan; and developing and better utilizing sector-specific and local-level M&E work.

Subsequently, a final evaluation of the NAP was undertaken between 2021 and 2022,

which aimed to assess the success of the plan’s implementation and associated challenges, as well as identify further adaptation efforts needed (Government of Finland, 2022). Multiple methods were used as part of the evaluation, including assessment of policy and legislative documents to evaluate the state of adaptation efforts with fields and coherence across fields; workshops for regional public officials to provide insights on the state of adaptation and associated challenges and gaps; workshops for national officials to discuss objectives for the next ten years and actions to achieve said objectives; a survey sent to municipalities to understand the state of adaptation at the local level; interviews with various public officials to assess human and economic resources dedicated to adaptation; and a literature review of reports across EU countries to identify adaptation policy development paths.

The final evaluation concluded that:

- a. Climate change impacts are receiving increased attention in all administrative sectors, as evidenced by references to climate change in regulations and other policies.
- b. While the NAP contributed positively to goal setting and increasing awareness of the need for adaptation, sectors have progressed at a different pace in taking action and setting guidelines that would concretely strengthen adaptive capacity.
- c. The country maintained research and development activities supporting the development of adaptation measures and policy preparation.
- d. While monitoring of adaptation measures at local and regional levels is developing, it remains fragmented and there is no unified database to support sharing of good practices and the development of further actions.

### 3.2.4 Viet Nam

Viet Nam’s 2020 NDC included plans to establish an M&E system for adaptation at the national, local, and project levels (The Government of Viet Nam, 2020). It was envisioned that the country’s National Committee on Climate Change would



steer the effort, with the Ministry of Natural Resources and Environment coordinating, operating, and taking the lead in developing results-based evaluation indicators for the national M&E system, while also guiding local level actors in developing and reporting on indicator sets. The NDC also anticipated that the M&E efforts would ensure that adaptation initiatives in the country would be verifiable, not duplicated, and would produce a reliable information source for developing the first and subsequent biennial transparency reports under

the Paris Agreement's enhanced transparency framework.

In January 2022, the Prime Minister of Viet Nam issued a decision officially promulgating the national-level M&E system for adaptation.<sup>11</sup> It aims to provide a basis for managing, coordinating, and improving the effectiveness of adaptation activities. According to the decision, there are six core areas which the M&E system will assess. For each area, the decision specifies corresponding indicators. See table 1 below.



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11 See Decision No. 148/QĐ-TTĐ. Note that content from this decision highlighted in this technical paper was based on an unofficial translation. The original is available at <https://english.luatvietnam.vn/decision-no-148-qd-ttg-promulgating-the-national-level-climate-change-adaptation-monitoring-and-evaluati-216708-Doc1.html>

**TABLE 1.** Core areas and examples of corresponding indicators in Viet Nam's adaptation M&E system

CORE AREA	EXAMPLES OF INDICATORS
State management of climate change	Number of legal documents related to climate change adaptation developed and promulgated Number of standards on climate change adaptation issued
Strengthening resilience and adaptive capacity in core sectors	Proportion (%) of the area of degraded important natural ecosystems restored Number of medical facilities provided with equipment for prevention and treatment of diseases related to climate change Percentage of people and women in areas vulnerable due to climate change impacts receiving vocational training and livelihood transformation
Disaster risk reduction	Number of newly built and upgraded hydrometeorological and saline intrusion monitoring stations Percentage of households in disaster-prone areas relocated to a safe place
Investment/resources for adaptation	Rate of disbursement of capital for climate change adaptation
Science, technology, and international cooperation	Number of technologies applied for activities to adapt to climate change Number of international cooperation programs and projects on climate change adaptation implemented
Training and awareness-raising	Number of educational and training institutions that teach on climate change Number of programs and activities to raise awareness of climate change adaptation

The decision further stipulated that an online M&E database would be developed, which would contain information on the progress and results of adaptation activities; the M&E reports of ministries, agencies, and provincial level People's Committees; as well as other information related to adaptation. This database has been made available; it, along with the broader M&E system, has been developed with the support of the United Nations Development Programme and the Green Climate Fund.<sup>12</sup>

To implement the M&E system, an inception workshop was held in June 2022 by Viet Nam's Ministry of Natural Resources and Environment (NAP Global Network, 2022). It gathered representatives of various ministries and departments alongside international experts and consultants to review a draft of a manual that is designed to guide national and local actors who will prepare status reports under the M&E system. The manual – which was developed

with the support of the NAP Global Network – builds on the decision issued by the Prime Minister, elaborating on the concepts included in it as well as providing further guidance on how to operationalize it, addressing topics such as information collection, the use of indicators, and updating the online database. Workshop participants commented on the draft manual.

Some key lessons learned through the process of establishing the M&E system include (Tue et al., 2023):

- a. The importance of building on existing M&E approaches and practices within the country.
- b. Implementing adaptation M&E systems requires time and practical experience. As such, it can be helpful to start by testing and piloting the system – for example, with a limited set of indicators – to ensure that it is heading in the right direction.

<sup>12</sup> See <http://adaptation.dcc.gov.vn/en/>



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- c. An online system or database can be a worthwhile investment, as it can facilitate reporting in a simple and quick manner, as well as public information sharing and peer learning.
- d. Capacity-building, consultation, and training are essential to guide the implementation of the M&E system.

### 3.2.5 Tonga

Tonga published its *Monitoring and Evaluation System Guide* to support its Joint National Action Plan 2 on Climate Change and Disaster Risk Management 2018-2028 (JNAP2) in 2019 (Government of Tonga, 2019). Three core purposes guided the development of the system, namely, learning, accountability, and adaptive management. Notably, in defining learning as one of its purposes, the system guide emphasizes the importance of the M&E system enabling learning in culturally appropriate ways that are linked to indigenous ways of knowing in the country.

The design and mandate of the system were embedded in the policy contexts at the global

(Paris Agreement, SDGs, and the Sendai Framework for Disaster Risk Reduction), regional (the SIDS Accelerated Modalities of Action Pathway, the Blue Pacific Identity and the Framework for Resilient Development, and the Framework for Pacific Regionalism), and national level (the Tonga Strategic Development Framework, the Tonga Climate Change Policy, and the JNAP2). The system aims explicitly, for example, to contribute to reporting under international and regional frameworks/projects.

The M&E system for the JNAP2 attempts to assess progress in terms of the process of implementing policies plans and measures; the outcomes of these efforts; as well as the ultimate impacts in addressing national goals. Monitoring under the system focuses on the level of activities and processes/ outputs, whereas evaluation focuses on the outcome/impact levels. The impact indicators listed in the guide are drawn from the SDGs and the Sendai Framework indicators, which have been mapped against the national resilience targets. Examples of indicators defined in the M&E System Guide are showcased in Table 2 below.



**TABLE 2.** Examples of process, (proposed) outcome, and impact indicators from Tonga's JNAP2 M&E System Guide

EXAMPLES OF TARGET AREAS	EXAMPLES OF PROCESS INDICATORS	EXAMPLES OF (PROPOSED) OUTCOME INDICATORS	EXAMPLES OF IMPACT INDICATORS
Coasts	Vulnerability baselines for coastal sector developed	Total length of sewerage and drainage network at risk from climate hazards	Proportion of wastewater safely treated (SDG 6.3.1)
Public, Community and Private Buildings	A multi-hazard disaster preparedness, response and recovery plan for public and community building infrastructure developed	Number and magnitude of buildings-related vulnerability problems perceived by disabled and marginalized groups according to gender and age	Proportion of population living in households with access to basic services (SDG1.4.1)
Tourism	Resilience indicators (process, outcomes, and impacts) for tourism developed	Volume of water consumed by tourist facilities	Direct economic loss to cultural heritage damaged or destroyed attributed to disasters. (Sendai Framework C6)
Water	Monitoring system for water, soil health and coastal erosion developed	Number of cases of water-borne diseases	Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All services)
Community Resilience	Develop standard resilience guidelines for all community engagement activities	Number of people living below the poverty line that live in flood prone areas	Proportion of population living below the national poverty line, by sex and age (SDG1.2.1)
Private Sector	A costed and gender and social inclusion-factored resilient plant for the private sector developed	Reduced work productivity due to heat stress	Coverage of essential health services (defined as the average coverage of essential services based on tracer interventions that include reproductive, maternal, newborn and child health, infectious diseases, noncommunicable diseases and service capacity and access, among the general and the most disadvantaged population) (SDG3.8.1)

According to the guide, the process indicators will be assessed by gathering data from 22 Resilience Target Area Stakeholders, who are members of government, civil society, and the private sector who are engaged in the various target areas. Resilience Target Area Reporting focal points are responsible for soliciting the data on a quarterly basis. Data gathering is envisioned to take place through a standardized questionnaire for each target area that assesses aspects such as the progress and status of the activity in the reporting period, capacity needs, and lessons learned to advance

the activity for the next three months. A JNAP M&E Database was designed to facilitate synthesis, analysis, and comparison across target areas, and an M&E Officer is responsible for inputting questionnaire data into the database. A training workshop that took place in May 2021 helped build the capacity of representatives of various line ministries to fill in the questionnaire; feedback from some participants suggested that a biennial, rather than quarterly, frequency may be more appropriate given the pace of progress in the various activities.<sup>13</sup>

13 See <https://climatechange.gov.to/?p=4304>



It is proposed that outcome indicators will be evaluated annually by a Resilience Outcome Reporting focal point. Data will be sourced from vulnerability baselines and indicators as well as resilience interventions and outcome indicators implementation processes. This area is a work in progress, as vulnerability baselines are not currently available, but their development constitutes a key activity under each target sector.

Finally, the guide notes that a systematic process to integrate development and resilience reporting in relation to the impact indicators may be developed and operationalized in the future when further technical and capacity development takes place.

### 3.3 Barriers and opportunities

Considering the substantial financial, technical, and human resources necessary to establish and implement an M&E system for adaptation, the provision of support is a key factor in overcoming resource-related barriers. Leiter (2021) observed that “practically all developing countries engaged in NAP M&E received financial or capacity building support from bi- or multilateral donors.” The case studies presented in this chapter further underscore the significance of this support. Organizations like ICAT and the NAP Global Network are actively supporting countries in the development of their national M&E frameworks for adaptation and facilitating evaluations even in the absence of such frameworks.

In view of both the challenges associated with establishing and implementing national M&E systems for adaptation, countries appear to be taking various decisions to prioritize undertaking some M&E as soon as possible over building the most robust possible system from the start. For example, Panama prioritized the selection of indicators based on the availability of data at the national level and the existence of associated methodologies for tracking the potential indicators. Burkina Faso, on the other hand, published an evaluation report of their NAP with a simplified methodology as compared to the one initially envisioned in their NAP. Finland also struggled to operationalize the system developed, but found that undertaking the mid-term evaluation process – even in the absence of indicator data supposed to be generated through the monitoring system – served to motivate

some segments of the government to initiate monitoring efforts for their adaptation work. These country experiences are consistent with the trends noted in related literature, where the development of M&E systems for adaptation “is a continuously evolving process that often proceeds even as first monitoring reports have been published” (Leiter, 2021).

A significant opportunity for countries in the process of developing or updating their national M&E systems is to align these efforts with international commitments and international reporting and review mechanisms, and the Paris Agreement’s enhanced transparency framework in particular. In doing so, countries can help ensure that they generate information that can be used domestically to progressively enhance adaptation action and its effectiveness, but also to feed into the national documents and reports that they produce for the UNFCCC and other associated frameworks. This, in turn, may help reduce duplication and burdens associated with monitoring and reporting, and may increase the sharing of lessons learned.

Finally, the case studies featured in this chapter demonstrate the various ways in which countries are involving stakeholders in both the development of their M&E systems and in conducting the actual monitoring or evaluation itself. When developing M&E frameworks, engaging relevant stakeholders from within and outside the government can help ensure that proposed indicators or mechanisms are indeed feasible in light of available data and resources. When undertaking M&E, stakeholder engagement is critical to ensure that progress and any relevant data is captured comprehensively and accurately, and that any insights or lessons learned that can inform future adaptation planning and implementation are collected. Taking this a step further, Burkina Faso’s approach of incorporating a dissemination strategy in its monitoring report highlights the importance of governments taking a proactive approach to making sure that different groups of stakeholders are aware of the results of M&E. This not only helps strengthen accountability in the adaptation process, but also improves the likelihood that investments in M&E can yield dividends for everyone, from individuals and communities to corporations and government actors.



# 4

## DEVELOPMENT AND APPLICATION OF MONITORING AND EVALUATION SYSTEMS AT THE SUBNATIONAL LEVEL

Like adaptation planning and implementation, M&E of adaptation is not limited to the national level. As cities, states, provinces, and other subnational jurisdictions begin undertaking adaptation action, M&E is once again fundamental to ensuring the success, efficiency, equity, and sustainability of adaptation over time. Just as the need for adaptation M&E transcends governance levels, however, so too do the associated challenges.

A study of adaptation M&E among local governments in Australia found, for example, that “M&E is the weak and often undervalued link in the [climate change adaptation] planning cycle” (Scott and Moloney, 2021). Weak or absent adaptation M&E at the subnational level is not limited to Australia. Indeed, the IPCC (2022) has suggested that the “slow uptake” of M&E frameworks at the local level in fact “constrains potential for developing climate resilient urban development pathways.” This general absence of M&E for adaptation at the local level around the world reveals, according to the IPCC (2022), that local adaptation managers lack awareness of the importance of M&E for adaptation decision-making; that available M&E resources are inadequate, irrelevant, or underused; or that the knowledge, capacity, and/or resources to implement M&E systems for adaptation at the local scale are missing.

Developing M&E systems for adaptation at the subnational – and particularly urban – level will be a largely incremental and additive process that builds upon existing monitoring systems (Solecki and Rosenzweig, 2020).

Solecki and Rosenzweig (2020) identify six key dimensions that are central to the development and application of such systems at the urban level:

- a. **Flexibility:** Systems must have the capacity to respond to various climate risk conditions and adjust as new risks, response strategies, technologies, or data collection tools emerge.
- b. **Continuity of data:** Evaluating trends over time and in comparison to long-term projections is important for effective M&E.
- c. **Complexity:** Urban areas are highly complex, with “properties atypical of more natural settings in peri-urban, suburban, or rural locations (e.g., distorted heat capture and energy balance, degraded hydrology, and complex flood patterns)” which can complicate understanding of cause-and-effect mechanisms.
- d. **Equity:** It is important for M&E systems to facilitate understanding of climate risks faced by marginalized groups, and how adaptation strategies and efforts can (or cannot) address this.
- e. **Operational resiliency:** The M&E system put in place should be sustainable and able to function without interruption through personnel changes and funding shortages. Physical components of the systems (e.g. sensors) should also be able to cope with damage.



- f. Multiple spatial and temporal scales: M&E systems should be designed to generate data and insights that decision-makers and other stakeholders at the local level can act upon. This can range from block- or neighbourhood-level data to infrastructure shed and supply chain scale data that extend beyond city boundaries.

The remainder of this chapter presents five case studies of the development and application of M&E systems for adaptation at the subnational level. It aims to demonstrate the key steps and considerations that underpin the approaches taken to adaptation M&E by subnational government actors in different regions around the world.

## 4.1 Case studies

### 4.1.1 Barcelona, Spain

Barcelona's 2018 climate strategy, The Climate Plan 2018-2030, identifies over 240 measures to be implemented for the city to meet its climate targets (Barcelona City Council, 2018).

To track and assess the implementation and effectiveness of the Plan, each of these measures is assigned an associated indicator. The process of formulating this indicator set first disaggregates the Plan's measures into 5 priority areas and 18 associated lines of action.

The priority areas identified in the Plan are: people's well-being; improved building efficiency; transforming public spaces into healthy, biodiverse, efficient and inclusive settings; uncoupling the quality of people's lives from economic growth through a climate economy; and collaboration from an informed, proactive, and empowered citizenry. Each of these is associated with a set of lines of action. For instance, developing more green areas, conserving the seafront, and planning with a climate focus are all lines of action under the priority area pertaining to public space transformations. In turn, every line of action includes short-, medium-, and long-term actions. These actions are accompanied by their rationale, values and expected benefits, key municipal players involved, associated lines of actions, illustrative examples, and a



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set of monitoring indicators. The indicators detail both tangible results as well as propose timeframes for implementation.

The Plan sets out a detailed methodology with regard to the indicators. At the outset, all indicators are chosen based on certain essential characteristics. These are relevance; availability of easy-to-calculate data; sensitivity to changes; completeness; ease of interpretation; and comparability. Given these, the Plan identifies a comprehensive list of impact, action, resource, environment, perception, and performance indicators. The scope of these indicators is all-encompassing, and therefore allows for a more comprehensive assessment. For example, the line of action, “preventing excessive heat,” has a series of monitoring indicators including the number of times the heat wave protocol is activated, percentage increase in the city’s tree cover, the number of shelters identified and set up, the degree of cover these offer, and also the energy they consume. Likewise, the line of action, “developing more green spaces,” is assigned the following monitoring indicators: green surface area (total hectares and hectares per inhabitant), proximity of green spaces, number of ephemeral gardens per district, and percentage of adapted tree species.

The Climate Action Plan was supplemented in 2020 by the Barcelona Climate Emergency Declaration, which proposes certain adaptation changes to the 2018 Plan (Barcelona City Council, 2020). The 2020 update allocates dedicated budgets to every action proposed, offering yet another way to tangibly monitor and track progress. The Emergency Declaration and the Action Plan now operate in conjunction with one another.

The diversity of the priority areas and lines of action identified within both plans necessitate a cross-departmental effort, which is reflected in the diverse bodies involved in the M&E process. On the municipal level, the plan creates a dedicated team within the Public Space Co-Responsibility Board to deal with the monitoring and assessment of climate change policies in the city. This is supplemented by three independent working groups, the first of which, the Resilience and Adaptation to Climate Change Plan group, focusses on adaptation.

Monitoring and evaluation of indicators is disclosed through various channels. As such, progress tracked against indicators is routinely monitored and reported annually to the CDP. The information submitted to and provided by CDP includes details on all adaptation action being carried out on the basis of hazards identified within the following sectors: energy, food, water, urban planning, waste, and transport. Similarly, a 2021 Monitoring Report of the 2030 Climate Emergency Action Plan has also been produced by the Barcelona City Council, which tracks advances made with respect to Barcelona’s climate priorities. By describing the scope of activities being implemented, following up on the status of actions taken against individual indicator timeframes, and detailing the related results, the monitoring report offers a holistic picture of the progress made under the city’s climate policies. Such a report is to be developed and published annually.

In addition to this, technical documents including environmental impact reports are made publicly available by the city’s urban information portal. Moreover, Barcelona’s Climate Plan is rooted in a multi-stakeholder approach, reflected in the workshops and presentations carried out jointly between the city government, the public, and relevant agencies; these allow for objective and participatory evaluation of the effectiveness of the measures identified within the Plan. For the same reason, the existing Table for the Climate Emergency, a working group of the Citizen’s Council, has likewise been expanded to include The Citizen’s Assembly for Climate with the aim of sharing progress and inviting objective assessment.

#### 4.1.2 Buenos Aires, Argentina

The City of Buenos Aires Climate Action Plan 2050 is underpinned by a set of six guiding principles (Government of the City of Buenos Aires, 2020). These are objective, quality data; the interdependence between adaptation and mitigation; consideration of all stakeholders involved; the integration of climate action with clean air policies; a coordinated agenda; and the role of nature-based solutions.

Based on these principles, the development of the Plan and of the M&E structure within



Abbreviations and acronyms

Introduction and background

Approaches and challenges in monitoring and evaluating adaptation

Development and application of monitoring and evaluation systems at the national level

Development and application of monitoring and evaluation systems at the subnational level

Discussion

Conclusion and next steps



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it, entailed the identification of 290 climate-related actions to be taken; of these, 111 were selected and 19 were prioritized. Actions were determined based on primary benefits, co-benefits, and feasibility. Co-benefits include air quality and health; mobility and new spatiality; employment, income and poverty; energy; green areas; everyone's involvement; and waste management.

In turn, every action is allocated a set of targets – both mid-term (2030) and long-term (2050) – and all targets are grouped under a specific goal. These goals aim to create a prepared, inclusive, innovative and low-carbon city, and pertain to transport, adaptation and global benefits, energy, and waste. Every target is also allocated sub-actions and/or complementary actions, a timeline, and the sectors involved. By breaking down individual targets, highlighting the interconnectedness between them, and setting timelines

for implementation, the Plan makes the monitoring process easier and more thorough.

For example, under the Adaptation and Global Benefits goal, for the action “Major Public Works Facilities to Reduce Risks,” the Plan identifies a target of “zero people evacuated due to storms by 2050.” Moreover, it also highlights a set of sub-actions and complementary actions.

With respect to a formal structure for M&E, the Plan capitalizes on the strength of Buenos Aires' M&E systems and its open data policy. In doing so, it creates a specialized dashboard for the Climate Action Plan 2050.<sup>14</sup> The dashboard is intended as a repository of data, documenting progress made towards specific actions and their results. As such, the data within the dashboard corresponds to a set of follow-up and impact indicators. The inclusion of two distinct types of indicators allows for the tracking of both status and effectiveness. In addition to this, the Plan also stipulates the inclusion of more general

<sup>14</sup> See <https://buenosaires.gov.ar/climate-action-plan>



indicators that correspond to global mitigation and adaptation goals.

The specialized dashboard is expected to be a collaborative process, in that all relevant ministries and agencies within the government must monitor and report on indicators applicable to their line of work on a monthly basis. The routine disclosure of results allows for comprehensive and real-time evaluation. Moreover, by way of reporting, all indicators are compiled and the results disseminated and assessed annually. These M&E reports are distributed widely, including but not limited to the Head of Government, the Legislative Branch, international networks, and citizens.

The inclusion of the Head of Government brings climate-related issues to the highest levels of decision-making. In addition to the annual M&E report, the Plan also requires a monthly progress report and a biannual management evaluation to be submitted to the Head of Government. Likewise, reporting to the legislature is a requirement of the Climate Change Adaptation and Mitigation Law of Buenos Aires. A survey of the results and effectiveness of the Climate Action Plan is also required every five years as per the same law.

#### 4.1.3 Lagos, Nigeria

Lagos' Climate Action Plan, or the Second Five Year Plan 2020-2025, identifies a series of measures to be implemented in accordance with a set of climate-related hazards highlighted in the Lagos Resilience Strategy (Lagos State Government, 2021). As such, it sets adaptation goals and associated priority actions. The adaptation goals are grouped into the following categories: resilient ecosystems; flood-proof Lagos; political flexibility and responsiveness; social inclusion of vulnerable groups; and developing an adaptive and resilient transport network. Each of these thematic goals are assigned a set of actions, for which the lead agency, timeline for implementation, key performance indicators, and co-benefits are identified. The inclusion of these factors facilitates effective data collection, monitoring, and evaluation.

The Plan requires Lagos to use Nigeria's existing Monitoring, Reporting, and Verification (MRV)

system as a basis to develop a similar framework dedicated to the Climate Action Plan. The MRV system is inherently collaborative, in that it is managed by the Federal Ministry of Environment, along with other federal ministries, state government representatives and the Inter-Ministerial Committee. In particular, the latter is key to the Climate Plan's MRV system, as it acts as a central coordination unit for collecting M&E data from all relevant stakeholders. To this end, the Plan also proposes a comprehensive governance structure, which will help facilitate the effective development and implementation of the actions within it. The structure consists of a Council, a State Climate Change Forum and a secretariat. Together, the proposed structure aims, among other things, to monitor progress and effectiveness, and review policy direction based on the results obtained. Moreover, the governance structure is also created to provide oversight regarding the efficient use of resources for the implementation of specific actions within the Plan, thereby making it easier to monitor and evaluate progress.

M&E data is to be collected based on a set of monitoring indicators associated with each individual action and goal. The Plan emphasizes that monitoring indicators must be both quantifiable and possess relevant historical time-series data in order to establish a baseline for evaluation. Moreover, indicators must be accompanied by a data source, data collection method, collector, start date and period, and the cost of data.

For example, under the goal "Developing an Adaptive and Resilient Transport Network," a specified action entails the expansion of the water transportation network with increased private sector participation. The lead agency for planning and implementation is identified as the Lagos State Waterways Authority, the designated timeline stands at two to five years, and co-benefits of the action include improved adaptive capacity with respect to floods and reduced impacts from the urban heat island effect. The indicators include the identification of priority areas for intervention, identification of investors, an increased ferry fleet, and increased passenger numbers.

Furthermore, Lagos' Climate Action Plan's M&E framework includes a gender perspective. As



such, the Plan highlights a commitment to gender-sensitivity in all climate change-related policy and planning. Most importantly for the purposes of M&E, the Plan stipulates the use of gender impact assessments to evaluate the implications of all adaptation actions taken. The use of gender-disaggregated results highlights the recognition on the part of the city government that women are disproportionately impacted by the effects of climate change, and therefore the use of needs and impact assessments for women is imperative in the development, monitoring, and evaluation of climate policy.

Additionally, the Plan considers logistical barriers to implementation and effectiveness by setting targets for both funding and human resources. By setting targets for both funding and staff required for the implementation of specific actions, the Plan adds an additional layer to its M&E framework.

#### 4.1.4 Mumbai, India

Mumbai's Climate Action Plan 2022 disaggregates climate-change related hazards and measures by sector (Municipal Corporation of Greater Mumbai, 2022). As such, it sets six sectoral priorities relating to energy and buildings; sustainable mobility; sustainable waste management; urban greening and biodiversity; urban flooding and water resource management; and air quality. For each sector, the Plan considers barriers to implementation with respect to policy, finance, institutional governance, and knowledge.

The Plan identifies sectoral action tracks, consisting of priority (2030), medium- (2040) and long-term (2050) actions to be taken. Each sectoral action track also identifies implementing stakeholders, a timeline for implementation, sources of funding and monitoring indicators in the form of both output and outcome indicators. The combination of these helps facilitate comprehensive M&E.

For example, within the sectoral area "Urban Flooding and Water Resource Management," one specific action track aims to "build flood resilient systems and infrastructure to

minimize the risk of flooding and associated impacts." A priority action within this track aims to reduce the surface run-off coefficient and increase permeable surfaces by conserving existing green and blue spaces, retrofitting land surfaces with recycled material and introducing hybrid and nature-based solutions, especially at midstream levels to avoid run-off into low lying areas. Given that this is identified as a priority action, it is associated with a 2022-2030 timeline for implementation. Relevant stakeholders include various departments within the Brihanmumbai Municipal Corporation, including those pertaining to Garden & Trees, Roads, Environment, and Disaster Management. Monitoring indicators include both output and outcome indicators. The former includes vegetated area created, area of riverbanks and slope stabilized and volume of water retention capacity created. The latter includes the percentage of heavy rainfall leading to flooding and/or erosion. Similarly, this action track also establishes medium- and long-term actions, each associated with relevant stakeholders, timelines, and indicator sets for M&E.

Mumbai's Climate Action Plan proposes considerable changes to institutional governance structures to facilitate effective M&E. As such, the Plan proposes for the Brihanmumbai Municipal Corporation Department of Environment to be expanded, strengthened, and renamed as the Department of Environment and Climate Change. Among other things, a key objective of this new department is the monitoring of the plan's progress. To this end, the Plan details the department's structure, highlighting seven verticals within it, one of which pertains to knowledge management. This vertical will consist of a Monitoring, Evaluation, Reporting, and Learning (MERL) cell. The MERL cell is to comprise a team of 24 climate officers, 11 departmental MER analysts, and led by a Chief Scientist, responsible for reporting to the DMC-Environment and the AMC-City. By establishing clear structures and reporting lines, the Plan seeks to facilitate effective M&E by strengthening accountability.

The MERL cell must conduct a biennial update of the GHG inventory, climate risk assessment,





and monitor the progress of the Mumbai Climate Action Plan once every five years. This monitoring must consider progress against the targets identified within the Plan as well as relevant key performance indicators (KPIs) and monitoring indicators. As such, the Plan establishes KPIs for every priority action within each sectoral priority area specifically for the purpose of M&E. For instance, KPIs for priority actions within the Urban Planning, Green Cover and Biodiversity priority area include per capita green space and annual tree census, for actions aimed at increasing green cover. Likewise, KPIs for actions aimed at strengthening heat resilience include mean land surface temperature and the number of heat prone wards disaggregated by income level.

Furthermore, the MERL cell must also develop a comprehensive learning system which can integrate lessons learned back into the Climate Action Plan. The inclusion of a formal learning system within the Plan's M&E structure helps ensure a constant feedback loop for lessons learned. As such, the MERL must conduct a comprehensive evaluation once every five years, for which an evaluation and reporting template is proposed in the Plan. The template includes output indicators, targets and associated dates, current progress on a given date, and sources of data. Furthermore, by way of reporting, the Plan stipulates that the MERL cell must prepare a progress report every three years in order to track indicators across three distinct levels of analysis. These include indicators at an aggregate city level, as per KPIs, and as per outcome indicators. The Plan also includes tangible examples of indicators to facilitate the process.

#### 4.1.5 British Columbia, Canada

British Columbia's Climate Preparedness and Adaptation Strategy draws on lessons from previous reports and risk assessments, including the CLEAN BC plan, which set out a commitment to develop a strategy for climate change adaptation (Government of British Columbia, 2022b). The 2022 strategy rests on six guiding principles. These include a shared path with indigenous peoples; an equity informed approach; nature-based solutions; health and well-being; aligning adaptation and emissions reduction; and a proactive business case.

Actions within the new strategy are grouped into four key pathways: foundations for success (partnerships, knowledge, and decision-making); safe and healthy communities; resilient species and ecosystems; and climate-ready economy and infrastructure. Each of these includes a set of priority areas, and each priority area contains specific measures to be taken. To this end, the annex to the strategy details information regarding lead ministries for implementation, timelines, funding opportunities, and key milestones. The inclusion and availability of such data facilitates the M&E process, an integral part of the "foundations for success" pathway.

Comprehensive M&E is a central tenet of the strategy's guiding principles. As such, the Climate Action Secretariat is developing a comprehensive M&E framework to assess progress towards the actions within the strategy. It is a collaborative endeavor in that it is to be developed alongside relevant line ministries and the federal government – the latter to ensure that there is alignment between British Columbia's provincial strategy and the National Adaptation Strategy's M&E framework.

The government of British Columbia is required by law to track progress and annually report its findings through the Climate Change Accountability Report. This details annual spending and action related to climate change adaptation and serves to facilitate both accountability and transparency. The report assesses every pathway and every action detailed in the strategy. To this end, it details the extent to which actions have been completed, as well as those planned for the coming years. For example, the 2022 report highlighted actions undertaken including 11 courses delivered by six universities to build adaptation skills for professionals; developing and piloting the British Columbia Extreme Heat Alert Response system and releasing preparedness guides; completing a climate change risk assessment for park infrastructure and cultural sites; and more (Government of British Columbia, 2022a). It further notes that a comprehensive monitoring and evaluation framework specific to the province's Climate Preparedness and Adaptation Strategy is also under development.



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## 4.2 Barriers and opportunities

In some cases, subnational governments have the opportunity to take advantage of existing M&E systems – including systems for adaptation in use at different levels or related systems in use at the same level – to inform or guide the development of their own frameworks. For example, Buenos Aires planned to take advantage of its existing M&E systems, whereas the Climate Action Plan in Lagos stipulated that it must develop its monitoring system on the basis of the national MRV system. Use of non-climate specific systems and indicators can include those in use at the sectoral level; for example, agricultural or water-related monitoring can offer insights for adaptation while benefiting from “pretested and accepted indicators” (Noltze et al., 2021). These built-in complementarities can help to avoid duplications and make subnational adaptation efforts easier to reflect in national-level M&E and reporting.

Moreover, the potential for complementarities between the national and subnational level in terms of M&E is bidirectional. Subnational jurisdictions can pilot M&E systems and serve as laboratories to test out indicators and approaches. National governments can then expand these systems, building their national frameworks from the bottom up.

Such an approach was taken, for example, in Morocco (see IIED, 2019 and AC, 2021). More concretely, Leiter (2015) outlines three avenues for linking adaptation M&E across scales: using standardized indicators at different levels; using level-specific metrics such that information on common themes is reported or flexible indicator sets are used; and using informal links and synthesis, for example informal dialogues or synthesizing and reporting available subnational-level information alongside national information.

Subnational governments may also increase the effectiveness and sustainability of their adaptation M&E efforts by creating dedicated institutional structures to undertake M&E. Mumbai’s MERL team, discussed in section 4.14 above, is one such example. Such an approach may avoid situations wherein M&E is expected to be absorbed into the tasks of existing personnel and institutions wherein there is little capacity and few resources to carry out regular monitoring, reporting, or evaluation. In addition, the mandate to the MERL team in Mumbai to establish a comprehensive learning system to support M&E illustrates one approach for proactively facilitating the learning function of M&E rather than relying on the M&E process to generate lessons learned and feed them back into the planning and implementation of adaptation passively and by default.





# 「5」 DISCUSSION

## 5.1 Overview of barriers, challenges, and opportunities

The case studies presented in this technical paper represent only a small segment of the flurry of activity related to the M&E of adaptation that is taking place at the national and subnational level. They demonstrate the growing commitment on the part of national

and subnational governments to move forward with adaptation M&E despite the range of significant challenges that impede both the development and application of M&E systems at various levels of governance.

Table 3 presents an overview of some of these barriers and challenges, as well as the related opportunities for overcoming them.



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**TABLE 3.** Barriers, challenges, and related opportunities in the development and application of M&E systems for adaptation at the national and subnational levels

CATEGORY	BARRIERS AND CHALLENGES	RELATED OPPORTUNITIES
Development of indicators	No common metrics, indicators, or definition of success/effectiveness for adaptation	<ul style="list-style-type: none"> <li>Review existing indicators from literature or other contexts</li> <li>Prioritize indicators based on significance and data availability</li> <li>Use qualitative and quantitative methods to assess progress</li> </ul>
Uncertainty and long-time horizons	Climate change impacts and adaptation results are uncertain and take a long time to manifest	<ul style="list-style-type: none"> <li>Adopt a learning-by-doing approach and adjust over time</li> <li>Institutionalize learning in the M&amp;E system, e.g. through the development of a formal learning system</li> </ul>
Data availability and reporting	<ul style="list-style-type: none"> <li>Limited availability of high-quality data related to adaptation</li> <li>Lack of or unclear reporting mechanisms for adaptation information</li> </ul>	<ul style="list-style-type: none"> <li>Develop agreements with national institutions to enable the transfer of data needed for the M&amp;E system</li> <li>Raise awareness of the importance of continuous and standardized data gathering for adaptation</li> <li>Engage a wide range of stakeholders to collect additional information and ensure a comprehensive and inclusive assessment of progress</li> <li>Establish institutions responsible for adaptation monitoring across sectors</li> </ul>
Capacity	Lack of technical and human capacity to design, implement, and sustain M&E systems for adaptation	<ul style="list-style-type: none"> <li>Align M&amp;E systems with related reporting obligations and practices to avoid further strains on capacity</li> <li>Where necessary and feasible, establish new institutional structures, such as dedicated teams, devoted to M&amp;E</li> <li>Seek technical support from relevant organizations</li> <li>Adopt a simplified M&amp;E approach if initially envisioned system is beyond current capacity</li> </ul>
Financial resources	Lack of sufficient resources to support design, implementation, and long-term sustainability of an M&E system	<ul style="list-style-type: none"> <li>Seek financial and technical support from relevant organizations</li> </ul>
Transition from development to application of system	Difficulty implementing M&E system as planned	<ul style="list-style-type: none"> <li>Identify key operational details at the time of design to ensure feasibility e.g., for indicators, the data source, data collection method, collector, start date, and cost of data</li> <li>Begin with a simplified M&amp;E approach and increase in sophistication over time</li> </ul>





## 5.2 Other considerations

### 5.2.1 Indicators

As evidenced by the case studies explored in the preceding chapters, indicators are commonly developed as central components of M&E systems at both the national and subnational level. Indicator-based approaches are also ubiquitous in the scholarship related to M&E of adaptation, with the IPCC (2022) noting “dozens” of such approaches proposed in the scientific and policy literature. While the advantages and appeal of indicators are clear – e.g. they allow for the measurement of variables perceived to be relevant to adaptation and facilitate the tracking of progress over time – it is important to carefully consider the role and selection of indicators. Expectations surrounding what indicators can and cannot do are not always realistic; their limitations in terms of facilitating decision-making in the face of competing interests or revealing how and why a given change has taken place should be kept in mind, for example (IPCC, 2022). In addition, despite the good intentions behind them, imperfect indicators can generate “perverse incentives,” that may inadvertently encourage outcomes that differ significantly from those that were originally envisioned (Hallegatte and Engle, 2019).<sup>15</sup> Examples of this phenomena abound in various sectors, from education and healthcare to criminal justice and unemployment services.<sup>16</sup> Some alternatives to indicator-centred approaches include surveys, scorecards, interviews, and focus groups (IPCC, 2022).

### 5.2.2 Tensions between robustness and feasibility in applying M&E systems

More broadly, there is a clear tension in the M&E of adaptation between establishing a process that results in the best possible understanding of a given jurisdiction’s level of adaptation and one that is feasible in the near-term. A common pattern that appears is national governments (and subnational actors) aiming initially for the former approach – elaborating ambitious plans for M&E in their

adaptation plans and related national documents – and subsequently finding themselves unable to follow through. In these cases, some governments then opt to pursue a more limited approach that focuses largely on process-related assessments of progress, if anything is produced at all. This speaks both to the significance of the challenges associated with M&E of adaptation, as discussed repeatedly throughout this report, but also to the aspirations of governments to use adaptation M&E to gauge their vulnerability, resilience, and adaptive capacity and to support data-driven decision-making. It also lends support to the following pieces of advice from the NAP Global Network secretariat, based upon their work with countries to develop M&E systems (Dekens, 2021):

- a. Get straight to the point: Clarify the objectives and purpose of the M&E system prior to any data collection, paying attention to “define what to monitor, evaluate, and learn from, as well as for whom and why.”
- b. Be boldly pragmatic: It is important to be realistic about what can be implemented in the near-term, avoiding “systems that are too theoretical, overly sophisticated, and not grounded on existing capacities and practices.”
- c. Pilot, learn from piloting and expand gradually: Once an approach and tools are developed, test them and adjust over time as needed. For indicator-based approaches, beginning with a small number of high-level indicators for which there is readily available or easily producible data is recommended. An incremental approach can then be taken to expand the system or increase its sophistication over time.
- d. Use reporting as a starting point for troubleshooting: Through a learning-by-doing approach, progress reports can serve as a “reality check” for the feasibility of different M&E approaches in the near term and draw attention to current gaps.

15 This insight is not new; it has been encapsulated in various adages. Campbell’s law holds that “The more any quantitative social indicator is used for social decision-making, the more subject it will be to corruption pressures and the more apt it will be to distort and corrupt the social processes it is intended to monitor” (Campbell, 1979). Goodhart’s law states that “When a measure becomes a target, it ceases to be a good measure” (Strathern, 1997).

16 Hallegatte and Engle (2019) point out various specific examples, such as surgeons becoming hesitant to perform on patients with high mortality risk when mortality rates are made public, or police officers shifting focus to tracking illegal immigrants rather than solving crimes in order to increase their number of arrests and, in turn, their performance bonuses.



While these suggestions shine a light on how to avoid further delays in getting started with adaptation M&E, it is important to simultaneously work towards more ambitious and innovative practices that better address the challenges elucidated above. Gregorowski and Bours (2022) highlight some opportunities to do so, which include: promoting a systems innovation approach to adaptation and its M&E, including through engagement with concepts such as complex systems and super-wicked problems; bolstering inclusivity, participation, and voice, including through the use of information and communications technologies (e.g. citizen-generated or -led data platforms); field testing new, innovative, and riskier M&E approaches to overcome risk aversion and “the perpetuation of established but often inappropriate approaches, methods, and tools;”

demonstrating and promoting the use of M&E for adaptive management, including through shifting to lesson learning in close to real time to facilitate course corrections; working across scales and socioecological systems in adaptation M&E; placing greater emphasis on systematic evidence and learning for replicability and scaling; and developing or adopting approaches and tools for adaptation M&E that are suited to systems innovation in adaptation, including technological innovation. Such steps will help move adaptation M&E towards a robust practice that is better suited to the adaptation imperative, generating insights that can inform adaptation assessments from the local level to the international level in the global stocktake, and thereby delivering knowledge that can support transitions towards transformational and inclusive adaptation.



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# 6 CONCLUSION AND NEXT STEPS

Monitoring and evaluation are fundamental components of efficient and effective implementation of climate change adaptation.

This technical paper has highlighted the challenges and opportunities for developing and operationalizing national and subnational M&E systems for adaptation globally. It has also identified the potential role of the AC, in collaboration with other constituted bodies and external organizations, to support further progress on adaptation M&E in the future.

The challenges and opportunities discussed throughout this paper lead to several key takeaways:

- a. The case studies featured here exemplify the dedication of national and subnational governments worldwide to advance adaptation M&E, reflecting a deepening awareness of its importance.
- b. The paper identifies a range of barriers and challenges faced in the realm of adaptation M&E. These include issues related to indicators, the tension between robustness and feasibility, and the risk of generating unintended incentives through imperfect indicators.
- c. While indicators often serve as central components of M&E systems, their selection and role must be carefully considered. Expectations should be aligned with their capabilities, and the potential for "perverse incentives" should be kept in mind.
- d. Governments often face a tension between aiming for comprehensive M&E systems that provide the best possible understanding of adaptation and adopting feasible processes in the short term. Pragmatism and incremental expansion are advised.

To enhance the coherence and impact of adaptation M&E at the national and subnational level, the paper offers the following recommendations based on the above analysis:

- a. National and subnational governments should design and implement the most robust M&E systems that are feasible given their data, capacity, and resources, while also seeking to improve the sophistication and comprehensiveness of these systems over time. This may involve starting with M&E systems that focus on the process and outputs of adaptation action, and gradually incorporating more indicators and methods to measure the long-term effect and impact of adaptation. Looking ahead, identifying opportunities to better assess transformative adaptation and systems-level adaptation and resilience can offer a pathway towards more nuanced understandings of adaptation progress over time.
- b. Multilateral funds and agencies supporting adaptation projects and programmes should align their M&E efforts with the broader M&E systems at the national or subnational level, and provide technical and financial support for their development



and application. This can help ensure that support provided is holistic, extending beyond project or programme boundaries to enhance systematic adaptation efforts, and that additional reporting or monitoring burdens are avoided.

- c. Subnational and national governments can benefit from aligning with existing M&E systems and reporting obligations or processes at different levels of governance. For example, national-level systems can

build on subnational systems while also helping to generate information required for reporting and communications efforts under the UNFCCC and other international fora. This can reduce burdens associated with M&E and reporting as well as enhance the quality and transparency of the information communicated at the international level. This information can inform processes such as the global stocktake that review progress towards global-level objectives.



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