WORLD RESOURCES INSTITUTE

Working Paper

CAPACITY NEEDS FOR GREENHOUSE GAS MEASUREMENT AND PERFORMANCE TRACKING

A Report on Scoping Activities in Six Countries

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1. EXECUTIVE SUMMARY

The World Resources Institute (WRI) is working through the Measurement and Performance Tracking (MAPT) project to help enhance national capacities in developing countries to measure greenhouse gas (GHG) emissions and track performance toward low-carbon development goals, where needed. GHG measurement and performance tracking is the process through which GHG emissions and emission reductions are measured and progress toward mitigation goals is regularly evaluated. Such systems can support both domestic policymaking and international reporting requirements.

To carry out the MAPT project, WRI is partnering with a broad range of stakeholders, including government agencies, the business community, and civil society organizations. In the early stages of the MAPT project, WRI and its partners conducted scoping research to assess the capacity needs in six countries—Brazil, Colombia, Ethiopia, India, South Africa, and Thailand—related to GHG measurement and performance tracking. This paper summarizes the results and, where possible, identifies common capacity challenges (see Table 1.1 for a summary)—as well as opportunities to overcome them—that are relevant to multiple countries. Capacity-building efforts, however, will need to also take into account local circumstances, stakeholder preferences, and past successes.

CONTENTS

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Table 1.1 | **Capacity needs identified by scoping research**

CAPACITY CATEGORY	CAPACITY NEED
Human resources	■ Staff dedicated to measurement and performance-tracking activities ■ Staff with technical measurement and performance-tracking skills ■ Trainings for staff related to measurement and performance tracking ■ Accredited monitoring and verification personnel ■ Experience measuring GHG reductions resulting from actions and policies ■ Improved technical capacity and staffing for corporate reporting ■ Training and capacity building for data collection
Institutions	■ Formalized system for data collection ■ Lead institution ■ Clarity of mandates, roles, and responsibilities to avoid duplication of responsibilities and activities
Information and technology	■ Data platform ■ Guidelines and standards for data collection ■ Reliable activity data ■ Regular data collection and analysis ■ Country-specific emissions factors ■ Improved performance tracking of mitigation policies ■ Appropriate GHG accounting methodologies ■ Guidance on accounting for upstream and downstream emissions ■ User-friendly reporting template for emitting entities and for civil society to use to monitor progress ■ Harmonized and comparable corporate reporting ■ High spatial resolution imagery in the forestry sector ■ Capability to model and project GHG trends ■ Mechanism to estimate GHG emissions ■ Robust quality assurance and quality control procedures ■ Verification
Financial resources	■ Adequate financial resources for hiring and retaining staff, training staff, and procuring necessary technologies

Supporting capacity building for measurement and tracking systems in a timely and targeted way is critical, as many countries are already developing such systems to meet a variety of objectives, such as enhancing GHG inventories, measuring GHG impacts of mitigation actions and policies, tracking progress toward national mitigation goals, facilitating climate finance, generating carbon credits, and preparing to meet international reporting requirements.

Our hope is that the research findings inform the work of those involved in capacity building for measurement and performance tracking, as they will continue to guide the activities of the MAPT project.

2. INTRODUCTION

JARED FINNEGAN AND AVIPSA MAHAPATRA

2.1 OVERVIEW

The World Resources Institute (WRI) is working through the Measurement and Performance Tracking (MAPT) project to help enhance national capacities in developing countries to measure greenhouse gas (GHG) emissions and track performance toward low-carbon development goals, where needed. To carry out the project, WRI is partnering with a broad range of stakeholders, including government agencies, the business community, and civil society organizations.

This report presents a synthesis of the results of scoping research carried out under the MAPT project in 2011 in six developing countries—Brazil, Colombia, Ethiopia, India, South Africa, and Thailand.[1] The information has been supplemented with research conducted since the scoping reports were first conducted, but the foundation of the research is from the initial scoping research conducted by in-country partners. Therefore, some advances may have occurred since the initial research was conducted.

The purpose of the research was to identify GHG measurement and performance-tracking capacity needs in each country as a first step in designing relevant and targeted capacity-building activities. It is important to note that GHG measurement and performance tracking is very much an emerging practice. Therefore, virtually all countries—developed and developing—have some related capacity needs in this area. This paper seeks to shed light on country-specific capacity-building opportunities for GHG measurement and performance tracking and, where possible, identify capacity challenges relevant to multiple countries. This foundational analysis of "trends" in capacity needs (discussed further in chapter 4) is intended first and foremost to support domestic needs related to measurement and performance tracking; however, it could also inform the work of GHG measurement practitioners, international policymakers, and other capacity-building organizations.

2.2 GHG MEASUREMENT AND PERFORMANCE TRACKING

Greenhouse gas (GHG) measurement and performance tracking is the process through which GHG emissions and emission reductions are measured and progress toward mitigation goals is regularly evaluated.[2] It can include a variety of GHG management activities, from the national level to the individual source level, such as

- development of national GHG inventories;
- development of subnational GHG inventories for states, provinces, cities, and sectors;
- development of corporate- and facility-level GHG inventories and reporting programs;[3]
- quantifying and tracking GHG emissions reductions from mitigation policies, actions, and projects;[4] and
- quantifying and tracking performance toward national or subnational GHG mitigation goals.

Developing countries face the challenge of achieving development goals while at the same time reducing GHG emissions in order to address climate change. To meet this challenge, many countries are implementing programs and policies that reduce emissions and contribute to sustainable development goals, such as national GHG emissions mitigation goals, low-emissions development

strategies (LEDS), and nationally appropriate mitigation actions (NAMAs).[5] GHG measurement and performance-tracking systems associated with such programs and policies allow governments and other actors to:

- design effective mitigation strategies, policies, and goals;
- monitor and evaluate progress toward meeting mitigation goals, strategies, and policies;
- communicate progress to domestic and international audiences, increasing trust and enhancing lessons learned;
- collect necessary emissions-related data from public and private entities;
- develop public- and private-sector GHG inventories;
- quantify emissions impacts associated with mitigation policies, actions, and projects; and
- track overall progress toward low-carbon goals.

In addition to facilitating domestic emissions measurement and performance tracking and decision making, GHG management systems also enable countries to meet international reporting needs under the United Nations Framework Convention on Climate Change (UNFCCC). Developing countries in particular are facing new requirements to internationally disclose more detailed emissions information through biennial update reports (BURs) to the UNFCCC. The first BURs are to be submitted in December 2014 and require developing countries to provide information related to:[6]

- national circumstances and institutional arrangements related to the preparation of national communications;
- national GHG inventories;
- information on NAMAs and their effects, including methodologies, assumptions, and progress toward implementation;
- finance, technology, and capacity-building needs and support received; and
- information related to domestic measurement, reporting, and verification (MRV).

GHG measurement and performance-tracking systems will be needed to generate and report these types of information.

2.3 MAPT RESEARCH APPROACH

To better understand the capacity needs for domestic GHG measurement and performance-tracking systems, WRI undertook scoping research in six countries—Brazil, Colombia, Ethiopia, India, South Africa, and Thailand—throughout 2011. The research was organized around six components of GHG management[7]— forestry and land use, industry, institutions, mitigation accounting, national GHG emissions inventories, and civil society policy implementation—described in Table 3.1.[8]

A combination of methods was employed to carry out scoping research in each of the six countries, including a capacity assessment questionnaire, stakeholder consultations and workshops, desk research, and country visits by WRI staff.

The capacity needs assessment questionnaire was the primary method used to carry out the scoping research. The questionnaire was developed by WRI staff and administered in each country by WRI's in-country partners. See Box 2.1 for a list of in-country partners. Partners were chosen on the basis of their expertise in the topic area, their relationship with key officials in the public sector, recommendations by government officials, and previous engagement with WRI. Since GHG measurement and performance capacity needs are not uniform across countries, partners were asked to amend the questionnaire to fit their national circumstances. The amended questionnaires were then used by partner organizations to guide interviews with local experts and practitioners.

Box 2.1 | **MAPT research partners for scoping assessment**

Brazil: Getúlio Vargas Foundation (FGV)

Colombia: Andrés Mogollón Duffó (independent consultant)

Ethiopia: Echnoserve Consulting

India: ABPS Infrastructure Advisory Private Limited

South Africa: Energy Research Centre, University of Cape Town (ERC)[9]

Thailand: Thailand Greenhouse Gas Management Organization (TGO)

More than 200 interviews were conducted across the six countries. Interviewees included individuals from government, business, and civil society and from a range of sectors, including energy, agriculture, forestry, and industry (e.g., cement, rubber, and textiles). Once interviews were completed, partners compiled responses into a final scoping report. The complete results for each country are available online at http://www.wri.org/our-work/project/measurement-and-performance-tracking-developing-countries. The key findings for each country and project component are presented in the body of this report.

Stakeholder workshops and in-country consultations with experts from government, universities, NGOs, and business were also carried out, as described throughout the sections of this report. Complementary desk research, conducted by WRI staff, included reviews of academic literature, government documents, and reports from international organizations and other NGOs. It is necessary to note two limitations of our research approach: first, we may not have reached key decision makers to capture all diverse views, and, second, despite vetting with partners, the questionnaire itself was not designed to adequately capture all relevant information.

2.4 DEFINING *CAPACITY* FOR THIS ANALYSIS

The MAPT project seeks to help build national capacities in developing countries to carry out GHG measurement and performance tracking by enhancing the capabilities and resources of government, business, and civil society. The scoping assessments carried out through the MAPT project and presented in this report aim to identify capacity needs as a first step in designing targeted capacity-building efforts. But what do we mean when we refer to *capacity needs* or *capacity building*?

In the literature, the concept of capacity is defined in a number of ways depending on the author, organization, and context.[10] For the purposes of this report, *capacity* is defined as the ability of individuals, organizations, institutions, and societies to perform functions, solve problems, and achieve objectives.[11] In the context of GHG measurement and performance tracking, *capacity* refers to the ability of governments and other actors to measure emissions and achieve reduction goals. Furthermore, capacities can be separated into the following elements:[12]

- **specified objectives**, including vision, values, policies, and interests;
- **efforts**, including will to act and efficiency;
- **capabilities**, including institutional, knowledge, and technical skills;
- **resources**, including human, information and technology, and financial; and
- **organization**, including planning, designing, sequencing, and mobilizing.

Table 2.1 | **Capacity categories**

CAPACITY CATEGORY	EXAMPLES
Human resources	■ Capacity and skills of individual staff, including managerial abilities and technical skills ■ Recruitment and retention of skilled staff
Institutions	■ Ability of institutions to perform functions to achieve objectives ■ Effective institutional arrangements, processes and coordination mechanisms, leadership, and institutional mandates ■ Capability to identify problems and develop and implement solutions
Information and technology	■ Availability and quality of data and information ■ Retention of institutional memory, archiving, and documentation procedures ■ Collection and dissemination of information ■ Technical and technological infrastructure (e.g., data collection platforms and monitoring technology)
Financial resources	■ Adequate financial resources to perform functions and achieve objectives, and the ability to manage these resources

Capacity-building efforts can aim to enhance any or all of these elements. This report and the MAPT project focus on capacities as they primarily relate to capabilities and resources.

Table 2.1 outlines and describes capacity categories that underpin this report's analysis. The categories were formulated in order to frame our analysis of the scoping results and their presentation in this report and are broad, nonexhaustive, and may overlap.

2.5 STRUCTURE OF THIS REPORT

This report is structured as follows: Chapter 3 presents research findings by MAPT project components across the six surveyed countries. Chapter 4 presents research findings for each country across the six MAPT project components. Chapter 5 describes capacity need trends revealed by the research and shared across all of the surveyed countries as well as status updates on the development of measurement and performance-tracking systems for select countries and the outputs of the MAPT project.

3. RESEARCH FINDINGS BY MAPT PROJECT COMPONENT

This chapter presents summary findings from the scoping research for each of the six components of the MAPT project. The components were chosen as a result of country needs and WRI strengths. See Table 3.1 for an overview of the components.

For each component, as mentioned above, research was conducted via the assessment questionnaire, desk research, and interviews, among other research techniques. The research approach for this chapter is outlined in Section 2.3, unless otherwise noted.

For some components, all MAPT countries are highlighted; for other components, the findings focus on a subset of MAPT countries. The complete results for each MAPT component by country are available online at http://www.wri.org/our-work/project/measurement-and-performance-tracking-developing-countries. The subsections below describe the scoping findings by component, as well as the priorities for the MAPT project that have emerged from the research.

Table 3.1 | **MAPT project components**[13]

MAPT PROJECT COMPONENT	FOCUS
Forestry and land use	■ Identifying capacity needs for developing forest carbon monitoring systems
Industry	■ Capacity building for developing corporate GHG emissions inventories and corporate reporting programs
Institutions	■ Institutional arrangements needed for effective GHG measurement and performance tracking
Mitigation accounting	■ Development of GHG accounting standards for estimating the GHG effects of policies and actions and tracking progress toward national and subnational GHG reduction goals
National GHG emissions inventories	■ Identifying capacity needs for developing national GHG emissions inventories
Civil society capacity to monitor policy implementation	■ Development of a framework for evaluating implementation of climate-related policies

3.1 FORESTRY AND LAND USE: TECHNICAL CAPACITY FOR FOREST CARBON MONITORING IN ETHIOPIA

KEMEN AUSTIN AND LORETTA CHEUNG

3.1.1 Executive summary

Countries implementing policies that aim to reduce greenhouse gas (GHG) emissions may need to develop or strengthen systems for measuring emissions in order to evaluate the effectiveness of those policies. For countries that have prioritized forest and land use-related policies as a means to mitigate GHG emissions, implementing a forest carbon monitoring system is essential to track progress toward emissions reduction goals. This subsection outlines WRI's assessment of Ethiopia's technical capacity and ongoing work in Ethiopia supporting capacity building for developing a forest carbon monitoring system.

3.1.2 Introduction

Ethiopia included the forest and land use sector as a major focus area in its sustainable development plan, the Climate-Resilient Green Economy (CRGE) strategy. In order to evaluate the country's progress toward meeting forest sector goals, Ethiopia plans to set up a system, and build capacity, for forest monitoring. To support this effort, WRI's MAPT project assessed Ethiopia's current technical capacity for forest monitoring and highlighted key areas for improvement. WRI conducted desk research and collaborated with an in-country partner, Echnoserve, to interview experts in forestry and related disciplines in Ethiopia.

The findings from this assessment of Ethiopia's technical capacity demonstrate the following priorities for monitoring forests and associated GHG emissions:

- setting up systems for consistent data collection and analysis that will enable detection of forest change over time;
- improving spatial resolution, either through high resolution satellite imagery or through field campaigns, to enable monitoring of small-scale forest changes such as forest degradation from fuelwood collection;
- standardizing methods for consistent data collection and analysis by subnational entities; and
- establishing a data management system that allows integration of forest and land use data, and provides access to information by a range of agencies.

As an extension of this work, WRI has developed case studies to draw lessons from other countries and regions and support Ethiopia's needs for forest monitoring, such as data management and forest information systems, institutional arrangements for forest monitoring, and national systems to support subnational monitoring.[14] These case studies demonstrate best practices and common challenges to the development of key components of forest and land use policy monitoring and evaluation. WRI will draw from the lessons learned from case study countries to develop recommendations for Ethiopia's forest monitoring system.

3.1.3 Tracking emissions in the forest sector: Focus on Ethiopia

With a forest cover of 50.6% of the country's total land area[15] (WBISPP 2004) and forest change accounting for an estimated 37% of total GHG emissions (Government of Ethiopia 2011), Ethiopia has made the forest and land use sector a focus for mitigation action. Ethiopia's recent CRGE strategy includes improved forest and land use management as one of four pillars supporting sustainable economic development. This strategy includes goals for reducing pressures on forest resources and increasing reforestation and afforestation activities. To track the country's progress in implementing the strategy, a critical first step will be for Ethiopia to set up a system to monitor forest cover change and associated GHG emissions and removals.

In addition, Ethiopia is undertaking readiness activities in preparation for the implementation of a Reducing Emissions from Deforestation and Forest Degradation plus conservation, sustainable management of forests, and enhancement of forest carbon stocks (REDD+)[16] incentive mechanism, which aims to provide funds to developing countries for conserving forests and maintaining forest carbon stocks. As part of this readiness process, Ethiopia plans to develop a monitoring, reporting, and verification (MRV) system. In November 2012, the country drafted a "roadmap" to establish a national REDD+ MRV system.

3.1.4 Research approach

To assess Ethiopia's current capacity for forest monitoring, WRI developed a capacity assessment framework (see Table 3.2) that captures key technical capacity needs for a comprehensive forest carbon monitoring system. This framework was developed through the review of guidance literature on forest carbon monitoring methods (Chasek et al. 2011; DeFries et al. 2007; GOFC-GOLD 2010; IPCC 2006). Using the framework, WRI completed desk research using resources such as Ethiopia's REDD+ Readiness Preparation Proposal (R-PP), the Global Forest Resources Assessment 2010 Country Report, and Ethiopia's Climate-Resilient Green Economy strategy. Interviews were conducted with government officials and in-country experts to gather additional information and verify the findings of the literature review.

Table 3.2 | **Assessment framework for evaluating technical capacity needs for forest carbon monitoring**

BACKGROUND	ILLUSTRATIVE QUESTIONS USED FOR GATHERING BACKGROUND INFORMATION IN FOCUS COUNTRIES
Country context	■ What is the extent of the country's forest cover? ■ Is forest cover change a major contributor to GHG emissions in the country? ■ What are the principal drivers of forest cover change and associated GHG emissions?
Policies and institutions	■ What are the existing policies related to mitigating GHG emissions from forest cover change and protection and management of forests? ■ Is a designated agency responsible for monitoring GHG emissions from forest cover change?
	ILLUSTRATIVE QUESTIONS USED FOR EVALUATING CAPACITY IN FOCUS COUNTRIES
Forest change detection and emissions quantification	■ Is the country monitoring forest cover change on the national level? ■ What is the spatial resolution of forest cover monitoring? Is the spatial resolution suitable to detect the important drivers of change? ■ What is the spatial extent of monitoring (i.e., wall-to-wall, regional)? ■ How often are data updated? ■ Does the country have a national forest inventory? Is it consistently measured and what is the frequency of measurement?
Subnational monitoring standardization	■ Are subnational entities involved in forest data collection? ■ Do subnational entities follow the same standards and protocols to consistently record measurements? ■ Is information collected by local and regional entities systematically sent to national-level forest monitoring agencies for aggregation of forest information?
Data integration and management	■ Is a mechanism in place to store and share data between the national agencies responsible for forest monitoring and management? ■ Is information systematically and regularly updated to reflect the most currently available data? ■ Is data infrastructure and information technology sufficient to maintain and exchange data? ■ Is information on forest cover integrated with spatial and technical data on land use management, including concessions, licenses, permits, and other contracts? ■ Is the information system centrally maintained and accessible to all internal users? ■ Does a clear mechanism link GHG emissions data to the decision-making processes?

Additionally, Echnoserve, WRI's in-country partner, interviewed experts from government agencies currently serving on the subtechnical committee of the CRGE strategy planning group. These government agencies include the Environmental Protection Authority, the Ministry of Agriculture, the Central Statistical Agency, the Forestry Research Center, and others. This study culminated in a report that compiled results from the interviews and detailed Ethiopia's current forest and land use trends and existing systems and capacity gaps for forest carbon monitoring (see http://www.wri.org/our-work/project/measurement-and-performance-tracking-developing-countries).

3.1.5 Research findings

Through the scoping phase of the MAPT project, WRI and our partner Echnoserve identified key technical capacity gaps currently limiting comprehensive forest carbon monitoring in Ethiopia. Capacity building in the following areas would substantially enhance Ethiopia's forest monitoring capabilities:

- **Regular data collection and analysis**: Ethiopia is not currently monitoring forest cover change on a regular basis. Our partners found that estimates of forest cover in Ethiopia are produced from national and subnational mapping projects, but these are one-time, externally funded projects and are carried out independently and inconsistently over time. Ethiopia's most comprehensive forest mapping and inventory project, the Woody Biomass Inventory and Strategic Planning Project (WBISPP), was carried out between 1989 and 2005 and supported by the World Bank. Since then, Ethiopia has not been consistently collecting forest data, and inventory reporting of forest GHG emissions continues to rely on data from the WBISPP. Additionally, while several projects carried out by local and international NGOs generate useful data, coordination between these projects and the government is limited.

- **Reliable detection of major drivers of forest cover change**: One of the major drivers of forest degradation in Ethiopia is fuelwood collection; 94% of household energy consumption is supplied by fuelwood. However, the detection of forest change from fuelwood consumption requires either high spatial resolution satellite or aerial imagery or ground observations of forest change. Both options are relatively high-cost and as a result Ethiopia is not currently reporting forest degradation due to fuelwood collection to the United Nations Framework Convention on Climate Change (UNFCCC) and the Food and Agriculture Organization of the United Nations (FAO).

- **Standardized methods for subnational data collection and analysis:** The WBISPP included a capacity-building component that trained local officials to involve them in standardized data collection. However, interviews showed that after the conclusion of the project, technical expertise was not sufficiently retained for forestry staff to replicate the process and maintain consistent methods for data collection without external support. Thus, subnational technical capacity remains low. Furthermore, our partners also found that subnational entities have not been regularly involved in data collection for GHG emissions accounting due to lack of financial and technical resources and skilled personnel.

- **Data management and integration:** Ethiopia currently lacks a coordinated system for managing and integrating forest-related data, including land use, permitting, and tenure data from various agencies involved in forestry work such as the Environmental Protection Authority (EPA) (now Ministry of Environment and Forests), the Ministry of Agriculture, and the Forest Research Centre. Such a system can aggregate and organize information in a timely and easily accessible way in order to support monitoring of forest-related policies.

3.1.6 MAPT activities for the improvement of Ethiopia's forest monitoring capacity

Based on the capacity gaps identified in the scoping phase and priorities identified by in-country stakeholders, under MAPT, WRI is engaging in a set of activities that aim to strengthen the Ethiopian government's capacity to track forest cover change and associated emissions. To achieve this aim, WRI:

- Produced a guidance document outlining the capacity gaps identified during the scoping phase of the project. This was used as a starting point for discussing priorities for capacity building that also takes into account institutional, human resource, and financial capacity needs.
- Developed a series of case studies from other countries and regions on priority aspects of forest monitoring systems. These case studies demonstrate best practices, common challenges, and areas where capacity building is needed. Topics elaborated in these case studies include:
  - data management and forest information systems;
  - institutional arrangements for forest monitoring; and
  - national systems to support subnational forest monitoring.
- Hosted a leadership workshop, in collaboration with Ethiopia's Environmental Protection Authority, in which participants discussed the results of the assessment and the case studies. They also elaborated relevant similarities and differences in the Ethiopian context. Participants included selected government officials, representatives from civil society organizations, and researchers from academic institutions. The workshop increased awareness of current gaps and priority areas for capacity building.

Through the above activities, WRI aims to help the Ethiopian Government use limited available resources efficiently to build a comprehensive forest carbon monitoring system.The development of such a system aims to assist in monitoring, evaluation, and ultimate achievement of the country's low-carbon development goals.

3.2 INDUSTRY: CORPORATE GHG ACCOUNTING AND REPORTING

NEELAM SINGH AND KALEIGH ROBINSON

3.2.1 Executive summary

Measuring corporate GHG emissions and developing an emissions inventory is the first step for businesses to form strategies to respond to climate change, assess their climate risk, and identify opportunities for cost and energy savings. Promoting the practice of accounting and reporting corporate GHG emissions in developing countries is one of the goals of the MAPT project. This subsection synthesizes the results of the research on capacity needs related to corporate GHG accounting and reporting in Brazil, Colombia, India, South Africa, and Thailand. First, we describe research activities conducted as part of the project. Second, we introduce corporate GHG accounting and reporting and discuss the specific activities undertaken to assess capacity needs in this area. We then discuss the results of these needs assessments and conclude by identifying activities to be pursued based on the findings.

3.2.2 Introduction

This section presents a synthesis of the results of the research on corporate GHG accounting and reporting.[17] The process of quantifying company or facility-level GHG emissions into a GHG inventory, using accurate accounting and reporting practices, can help a company assess its climate risks, identify opportunities for energy and cost savings, and develop effective mitigation strategies. A company's GHG emissions inventory is a list of its GHG emission sources and emissions, which have been calculated and reported per established best practice. Countries often establish a corporate or facility-level GHG accounting and reporting program[18] (voluntary or mandatory) to promote the development of GHG inventories. Some countries build emissions accounting and reporting capacity among businesses through dissemination of information and conducting regular training without establishing a comprehensive program.

Both approaches are useful in mainstreaming GHG accounting and reporting practices among businesses in a country.

Corporate GHG accounting and reporting programs (henceforth, corporate GHG programs) provide standards, tools, training, and a platform for companies to accurately account for and report their emissions inventories. A corporate GHG program encompasses all institutional, managerial, and technical arrangements for data collection, preparation of a GHG inventory, and managing the quality of emission inventories. Such programs benefit all stakeholders by creating a system for the standardized reporting of GHG inventories, as well as by developing quality management structures that can build confidence in the reported data, increase transparency, support review and assessments of emissions-related information, and facilitate accurate tracking of emission reductions. Corporate GHG programs are usually established and operated by partnerships among local governments, industry associations, and/or civil society organizations. For policymakers, transparent national and subnational corporate GHG programs not only promote the development of GHG inventories but also provide verifiable data to develop effective climate policies, lay a robust foundation for tracking progress on mitigation actions and strategies, and help validate sector-level data for national inventories.

In the absence of a corporate GHG program, industry associations in some countries have led capacity-building activities by offering regular training and information and developing sector-specific initiatives. In others, the government has led the way by establishing an installation-level reporting system and conducting outreach and training around it.

3.2.3 Research approach

Whether a country establishes a full-fledged corporate GHG program or promotes emissions accounting and reporting through other forums, it needs institutional and technical capacity as well as human and financial resources to be effective and produce sustainable results (see Table 2.1 for a description of each type of capacity).[19]

Survey questions and interviews, therefore, covered a number of different capacity aspects related to corporate accounting and reporting, including: technical resources (e.g., databases, tools); human resources; information management (i.e., the creation, storage, use, and review of data by human and technical resources); availability of integrated energy/GHG calculation tools and systems; reporting to stakeholders/sectoral or national agencies (e.g., reporting templates); confidentiality issues; and others. MAPT research partners and WRI gathered information on GHG data collection and management from businesses, methodologies used, capacity needs and challenges in compiling GHG emissions-related data, and GHG reporting practices in various emissions-intensive economic sectors.

During the scoping phase, supplemental approaches to assessing capacity needs and gaps related to corporate GHG accounting and reporting were also employed (see Table 3.3). These included stakeholder consultations and meetings, desk research, stakeholder workshops, and country scoping visits.

Table 3.3 | **Country-specific approaches to gather information to assess corporate GHG accounting and reporting capacity needs**

	APPROACHES TO IDENTIFY CAPACITY NEEDS		
	INFORMATION BASED ON WRI'S PREVIOUS EXPERIENCE IN THE COUNTRY	**CAPACITY NEEDS QUESTIONNAIRE REPORTS BY MAPT RESEARCH PARTNERS**	**WRI'S DESK RESEARCH AND SCOPING EXERCISE**
Brazil	Establishing the Brazil GHG Protocol Program and providing training and technical support to member companies in partnership with the Getúlio Vargas Foundation (FGV) Interviews and workshops with corporate GHG inventory verifiers	Report developed by the FGV based on questionnaire survey results	Relevant country-specific reports and articles
Colombia	Information gathered during the workshop led by the Colombian Ministry of the Environment and Sustainable Development on monitoring, reporting, and verifying emissions in the industrial sector in Colombia		Interviews and informal discussions with the Ministry of the Environment and Sustainable Development, business and industry associations, and civil society organizations conducted during a country scoping visit Relevant country-specific reports and articles
India	Working on corporate GHG accounting and reporting issues in the country and engaging with two industry associations (Confederation of Indian Industry and the Indian chapter of the World Business Council for Sustainable Development) on these issues	Stakeholder consultation workshop and a report summarizing the results of the stakeholder interviews. Interviews were based on the capacity needs questionnaire and were conducted by the local partner, The Energy and Resources Institute (TERI)	Relevant country-specific reports and articles
South Africa			WRI's interviews and meetings with the Department of Environmental Affairs and business and industry associations, such as National Business Initiative (NBI) and Business Unity South Africa (BUSA), conducted during a country scoping visit Relevant country-specific reports and articles
Thailand		Capacity assessment questionnaire report developed by Thailand Greenhouse Gas Management Organization (TGO) based on questionnaire survey results and a stakeholder workshop	

3.2.4 Capacity needs: Corporate GHG accounting and reporting component

In general, we found that a concerted effort is needed to build human resources, institutional, and technical capacity in countries to help companies effectively measure and manage their emissions, although a range of capacities already exist and provide a good foundation to build on. Different countries and businesses are at different stages, however, in their awareness of and capacity regarding these issues. WRI's previous experience, coupled with discussions during stakeholder meetings and workshops organized by partners, suggested a general need in countries for more financial resources to be devoted to corporate GHG accounting and reporting—by industry associations and policymakers interested in promoting best practices, and by businesses as they adopt these practices and develop their emissions inventories.

We should note that Brazil is a special case in its existing capacity, since a corporate GHG program has been present there since 2008, helping build adequate capacity in the areas discussed below. The experience of the FGV, the Brazil partner, in leading and implementing the program, WRI's experience from closely engaging with the program and with the participating companies, and the presence of the successful program itself with a membership fee for participating companies convey strong institutional and technical capacity and adequate allocation of financial resources by the businesses toward developing emissions inventories in accordance with best practices.

We discuss the findings, with relevant country-specific examples, in more detail below for human resources, institutional, and technical capacities.

HUMAN RESOURCES

Human resources capacity refers to the availability of skilled staff to support technical as well as nontechnical functions (such as managerial and convening roles) to promote corporate GHG accounting and reporting in the country. For instance, in a company, the existing environmental and health safety managers and energy managers can take on the role of GHG managers with adequate training. A new division within the appropriate government ministry may be given the responsibility to design an installation-level program staffed with emissions accounting and sector-specific experts as well as experienced conveners and managers. Within an industry association, staff with knowledge of sustainability and corporate reporting issues may be given additional training to develop a corporate GHG reporting program and/or to otherwise support businesses in emissions accounting.

During the research, countries identified a range of human resource-related needs and opportunities, such as scaling up the number of skilled staff, hiring new staff dedicated to work on emissions accounting with organizations, building on existing expertise in the country, and developing peer-to-peer learning exchanges.

For example, the results from the capacity needs questionnaire in Thailand highlighted the need to train more individuals (including business representatives and industry-related policymakers) in emissions accounting to increase the availability of skilled staff to support corporate GHG accounting and reporting initiatives. In Colombia, WRI-led interviews and discussions suggested that although a small group of policymakers and private-sector representatives have strong corporate GHG accounting and reporting expertise, this needs to be scaled up to meet the demands of an increasing number of companies interested in developing their emissions inventories.

In India, stakeholder consultations, interviews, and the capacity needs questionnaire report revealed widespread familiarity with the Clean Development Mechanism and, consequently, a good understanding of emission sources, activity data, emission factors, and boundaries, which provides a good foundation to develop further corporate emissions accounting and reporting capacity. In South Africa, WRI-led interviews during the country visit suggested the need for dedicated, skilled staff in a business association that has the mandate to build business capacity to disseminate best accounting and reporting practices in the country.

In both South Africa and India, interviews with staff of organizations that could potentially lead the promotion of GHG accounting and reporting in the countries showed a desire to learn from experiences of other developing countries (such as Mexico and Brazil) and identify opportunities for such exchanges to build their capacity. These interview subjects were interested in questions such as how to convey the significance of emissions accounting to businesses in a developing-country context,

what kind of accounting-related services are most useful to businesses, and what strategies to put in place to sustain these services over a period of time. WRI's scoping activities and the capacity needs questionnaire report in Brazil revealed the need to further strengthen human capacity to contend with complex accounting issues (e.g., to account for indirect emissions along the supply chain or agriculture-related emissions; to verify corporate emissions inventories; and to harmonize and support the implementation of an increasing number of federal and state policies mandating, incentivizing, or encouraging corporate emissions accounting and reporting).

INSTITUTIONAL CAPACITY

Institutional capacity here refers to the presence of effective institutions and agencies with the mandate to lead on and provide a range of services to promote corporate GHG accounting and reporting in the country. It also includes supporting processes and coordination mechanisms to enable adequate functioning of these institutions. Voluntary corporate GHG programs or mandatory GHG reporting programs often provide an institutional foundation for emissions accounting in countries. At the same time, a business association or sector-specific association can also conduct similar activities independently of a corporate GHG program. In a company context, institutional capacity includes all processes, activities, and organizational structures put in place to develop accurate and verifiable GHG inventories and measure performance over the years. The research found a mix of cross-sector and sector-specific initiatives in some countries, while in others, new institutions and supporting policies needed to be developed to build capacity in this regard.

Brazil provides an example of strong existing institutional capacity for corporate GHG accounting and reporting. In 2008, several organizations, including the Getúlio Vargas Foundation (FGV), the World Business Council for Sustainable Development (WBCSD), the Brazilian Business Council for Sustainable Development (CEBEDS), the Brazilian Ministry of the Environment, and WRI partnered to establish a voluntary Brazil GHG Protocol Program. The FGV led the program with an unambiguous mission and effective managerial and technical arrangements, and it established an institution that liaisons with businesses, ministries, and other agencies to adequately perform functions related to the promotion of GHG accounting. This program provides country-specific accounting and reporting specifications, calculation tools, and training for Brazilian companies to effectively account for and report their emissions. Today, nearly 100 of the largest companies in the country publicly report their GHG emissions through the program.

In South Africa and Thailand, interviews and desk research showed voluntary efforts to promote corporate GHG accounting and reporting. Stakeholder interviews during WRI's country visit and desk research showed that the South African government has committed to establishing by 2014 a mandatory GHG reporting program that will set up an institutional system with rules and guidelines to report installation-level GHG emissions. The capacity assessment questionnaire report from Thailand identified the need for supporting laws and regulations to mainstream corporate GHG accounting and reporting and also stated the need for a new unit or agency with the mandate to enforce corporate GHG accounting and reporting and to manage and coordinate GHG information.

In Colombia, stakeholder interviews revealed that the Ministry of Environment and Sustainable Development (MADS) is working on a new initiative with the Colombian Business Council for Sustainable Development (CECODES) and the National Business Association of Colombia (ANDI) to establish institutional capacity through a national, voluntary corporate GHG accounting and reporting program. WRI is supporting this effort as a technical advisory partner.

In India, during a stakeholder consultation workshop, business participants called for establishing an industry-led, voluntary corporate GHG program in the country and identified potential activities for the program. Desk research and interviews also showed that the apex planning body in the country, the Planning Commission, as well as the Expert Group on Low-Carbon Inclusive Growth, have called for the design of a national corporate GHG reporting system.

Finally, interviews and desk research identified sector-wide initiatives, such as the global Cement Sustainability Initiative (CSI), in countries such as India, Brazil, and South Africa. CSI is a sustainability program that has

standardized emissions accounting in the cement sector. It provides guidance to companies on accurately reporting their emissions and manages a global emissions database for the sector. Thailand's capacity needs questionnaire report found that the Thai Cement Manufacturers Association is planning to collect GHG emissions inventories for a group of cement companies. South Africa also has sector-level agencies working in this space. These kinds of efforts fill the institutional capacity gaps and help promote best practices in GHG accounting and reporting within specific sectors.

TECHNICAL CAPACITY

Technical capacity here refers to the stakeholders' ability to develop and/or apply best accounting and reporting practices and to undertake cross-sector and sector-specific GHG emissions quantification. It includes knowledge related to emissions accounting standards and methodologies, calculation tools for various sectors and sources, data collection and management systems, and GHG emissions registries.

Research revealed some existing technical capacity in countries, with significant potential to build capacity in one or more areas, such as in medium- and small-scale companies and in select sectors, and to build on accounting methodologies for emissions along the supply chain or along a product's life cycle.

Interviews during WRI's country visit to South Africa revealed scattered technical capacity, largely among consultants developing corporate GHG inventories, in basic corporate GHG accounting and reporting rules. There is a need to build this capacity among medium- and small-scale businesses and to provide guidance on advanced accounting methodologies, such as accounting for upstream and downstream corporate GHG emissions. Moreover, as the government establishes a mandatory reporting program, greater understanding is needed of how the new system differs from, and complements, the existing setup for the national inventory and how installation-level inventories compare with corporate inventories.

In India, the stakeholder interviews, capacity needs questionnaire report, and stakeholder workshop found a similar situation. Some experience exists with emissions calculations, as does an understanding of GHG accounting and reporting standards in large, multinational companies, but this capacity needs to be scaled up in medium- and small-scale companies. Interviews suggested that in some sectors, such as fertilizers and pulp and paper, even large companies need to build technical capacity to account for and report corporate GHG emissions. Further information is needed on calculating upstream and downstream emissions, and on developing a data management system or an emissions registry that can be securely managed by a potential corporate GHG program.

In Thailand, the capacity needs questionnaire report and workshop identified the need for technical capacity in corporate GHG emissions data collection and management as well as in calculation tools and accounting methodologies. Interviews and desk research revealed that a Product Carbon Footprint program exists in the country, but there is interest in further building corporate emissions inventory related capacity.

Interviews in Colombia point toward the need to strengthen technical capacity in accurately quantifying GHG emissions from various sector-specific sources and from upstream and downstream sources.

WRI's experience and capacity needs questionnaire report shows that Brazil is fairly advanced in terms of existing technical capacity and utilizing corporate GHG accounting best practices, given the availability of Brazil-specific methodologies and calculation tools, as well as the Brazil Program's online emissions reporting registry. The program is planning to strengthen technical capacity related to verification, agriculture sector emissions accounting and reporting, product life cycle accounting and reporting, and upstream and downstream emissions accounting.

3.2.5 MAPT activities: Corporate GHG accounting and reporting component

Based on the capacity needs results, which showed varying levels of capacity and awareness, the corporate GHG accounting and reporting component's focus will differ from country to country. In general, the component will emphasize capacity building through training on various aspects of corporate GHG emissions accounting and reporting in accordance with the country's needs

and, where appropriate, facilitate the establishment of corporate GHG programs that can serve as centers of excellence in all matters related to corporate GHG accounting and reporting. WRI, in collaboration with in-country partners, has designed a set of activities to address the key capacity gaps and needs in Colombia, India, and South Africa. The component will also focus on Thailand.

These activities will include one or more of the following depending on the country context:

- Conducting training workshops:
  - for business representatives on the WRI/WBCSD GHG Protocol Corporate Accounting and Reporting Standard, calculation tools, and other relevant standards, such as the GHG Protocol's Value Chain (Scope 3) and Product Life Cycle Accounting Standards;
  - for service providers to serve the demand for developing corporate GHG inventories and to provide related services (e.g., verification, mitigation strategies, among others);
  - for policymakers and business associations on designing GHG programs and various accounting and reporting standards and calculation tools; and
  - for potential trainers on conducting effective training courses on corporate GHG accounting and reporting.
- Building capacity in local governments, industry associations, or civil society organizations by training and/or supporting hiring of staff members dedicated to work on corporate GHG accounting and reporting issues
- Facilitating the establishment of corporate GHG programs to provide a range of corporate emissions accounting and reporting services and to address related institutional needs

Through these activities, WRI, in close partnership with local institutions, aims to facilitate development of capacities necessary to create a culture of corporate GHG accounting and reporting; support creation of the knowledge base for developing accurate, credible, and verifiable inventories; and assist businesses in measuring their GHG emissions. WRI is working with local partners, leveraging its global experience in the area of corporate GHG accounting, seeking multi-stakeholder support for proposed activities, and scaling up its impact by developing a pool of domestic experts and trainers.

3.3 INSTITUTIONS

SAMAH ELSAYED

3.3.1 Executive summary

Developing the requisite institutional capacity to measure and manage the emissions associated with climate policies across a range of sectors is central to effectively controlling and reducing GHG emissions. The emerging nature of this issue, however, means that many countries are having to adapt existing institutional setups or create new systems and procedures, presenting numerous challenges. Some of the major recurring issues that emerged from the scoping exercise included a need for improved coordination both within and across institutions, effective information sharing mechanisms, strong leadership from the designated lead institution, clear institutional roles and responsibilities, institutional mandates and legal agreements, improved staff capacity, and financial resources for institutions.

Based on the results of the scoping exercise, the MAPT project is working closely with partners to conduct in-depth research on institutional arrangements and functions, as well as to develop a standardized framework for assessing institutional capacity.

3.3.2 Institutional capacity

The institutions component of the MAPT project aims to strengthen the capacity of the organizations responsible for managing and reporting on a country's greenhouse gas (GHG) emissions. This can include the institution charged with leading national climate policy, other ministries responsible for monitoring emissions in key sectors such as industry and agriculture, as well as the private sector and local and state-level bodies. In many cases, while

countries do have existing institutional arrangements and procedures, these are for functions other than the emerging area of MRV. This presents many developing countries with the additional challenge of either adapting existing institutional systems and mandates to accommodate this new set of functions or developing a new MRV system from scratch. However, anecdotal evidence suggests that at times emphasis is placed on improving technical systems and methodologies (e.g., data management platforms or localized emission factors) for GHG tracking in developing countries and emerging economies without first ensuring that the necessary institutional arrangements are in place to support the sustainability of any efforts. As a result, countries need to first build the institutional capacity necessary to be better equipped to measure and manage the emissions associated with climate policies.

The definition of *institutional capacity* is broad and can encompass many areas, including management of the GHG tracking system, the processes and agreements in place, and the human capital required to effectively conduct these functions.

Some examples of core institutional functions, mandates, roles, responsibilities, and related capacities required for an effective MRV system can include (but are not limited to) the following:

- Clearly designated mandates of authority (i.e., all entities are aware of their specific responsibilities, as well as the roles designated to other institutions)
- Effective coordination and information sharing mechanisms across bodies and within a specific institution
- Data sharing agreements and/or mechanisms between the lead institution and data providers
- Long-term retention of institutional memory and capacity (i.e., institutional knowledge is not lost with changes in personnel or over time)
- Staff with the skills to effectively carry out the institutional responsibilities outlined above

3.3.3 Results of the institutional capacity needs assessments

The research conducted by our country partners identified a number of commonalities in institutional capacity challenges. The scoping results also indicated that a stand-alone assessment of institutional capacity is challenging given the interaction between institutional concerns and other capacity needs. For example, financial resources are necessary to fund effective institutional arrangements and processes. Human resource capacity is required to actually manage the GHG tracking system, and technical infrastructure for data and information processing is also intertwined with institutional concerns. As a result this subsection touches on a number of capacity types as they relate to institutional challenges.

This subsection draws on examples of the following common capacity concerns that emerged from interviews with stakeholders in the six countries:

- Clarity of institutional roles, mandates and legal agreements
- A need for improved institutional coordination and information sharing
- Levels of human resource capacity within institutions

More detailed information for all countries can be found in the WRI commissioned scoping and survey reports written by in-country partners.[20]

3.3.4 Clarity of roles and institutional mandates

One major recurring institutional challenge that the scoping exercise revealed was the need for clearly designated roles and responsibilities for managing and monitoring GHG emissions information, both within a lead agency and among institutions. In most countries, MRV activities are being added to the workload of existing institutions. Many countries are still in the process of establishing effective institutional arrangements to sustainably monitor and track GHG emissions, which will take both time and capacity building. As a result, in many

MAPT countries, systems have developed organically without a mandate in place detailing the responsibilities of the key institutions responsible for measurement and performance tracking, leading to confusion around roles, inefficiencies, and duplication of functions. The scoping research also highlighted that in many cases no legal or official agreements are in place to provide related mandates, particularly around data- and information-sharing obligations.

For example, in Ethiopia the scoping found that the country would benefit from clearer institutional mandates and procedures (Fikreyesus et al. 2011). Clearly defining the roles of important bodies and the arrangement of the measurement and tracking system emerged as an important requirement[21] for improving the country's ability to track GHG emissions and monitor policies. While Ethiopia's environmental policy (Proclamation No. 295/2002) designates the Environmental Protection Authority as the coordinating institution for environmental issues at the federal and state level, at the time of research, no clear institutional mandate assigned it responsibility for climate mitigation or greenhouse gas monitoring activities in the country. Beyond responsibility for the national inventory process (which has been assigned to the Environmental Protection Authority), no institution is explicitly charged with coordinating the collection and dissemination of emissions data and information at the national, subnational, or sectoral level.

The scoping exercise also found that mandates are necessary to direct agencies and sectors to report on their emissions. Without a reporting mandate in place the government will encounter difficulties in allocating resources to these bodies, including financial and personnel, for the tracking of GHG emissions.

Similarly, in Colombia, the scoping results highlighted the need to create a legal framework as the country develops its MRV system (Mogollón Duffó et al. 2011b). Survey respondents also felt that Colombia would benefit from clear institutional mandates that detail the specific responsibilities of various entities involved in the management, measurement, and tracking of GHG emissions.

In contrast, in South Africa, the monitoring and verification process for energy efficiency demonstrates a mature institutional framework with clear processes and mandates. In addition, the Department of Environmental Affairs' white paper, released in 2011, referred to institutional requirements for monitoring and evaluation.

3.3.5 Institutional coordination and information sharing

Potential areas for strengthening institutional coordination include a clear and efficient process for sharing information and data across institutions, as well as a systematic procedure for ensuring that climate and MRV concerns are successfully integrated into national priorities and policies. Effective procedures for institutional coordination, such as intergovernmental bodies and information sharing mechanisms, play an important role in the efficient functioning of a country's MRV system. The scoping exercise suggested that the absence of effective institutional coordination mechanisms is a key capacity gap in a number of MAPT countries.

For instance, survey respondents in India identified challenges in streamlining the measurement of GHG emissions and tracking of policies in the national missions of the National Action Plan for Climate Change (ABPS 2011). These missions involve a number of institutions, including several ministries and departments both at a national and state level, requiring strengthening of coordination mechanisms. In addition, the survey results emphasized the need for a dedicated and institutionalized inventory management authority and information system in order to facilitate high-level institutional coordination and effectively track emissions.

In Brazil, a number of institutions are involved in implementing the sectoral plans that make up the country's National Policy on Climate Change. While Brazil has put in place interministerial bodies to facilitate cross-institutional policy processes and procedures, survey respondents identified a few remaining challenges around coordination and integrated management. For example, survey respondents felt that a single system or platform would facilitate effective sharing and

distribution of data and information between institutions. While technical capacity is high and many institutions already possess the information they need to monitor emissions in their specific location or subsector, no single system effectively aids in sharing and distributing this information among entities (Osório and Piva 2011). Survey respondents suggested that an integrated information system or registry would help in sharing information and coordinating across institutions.

In Thailand, scoping highlighted that no central department is mandated with compiling data and information and ensuring coordination among relevant ministries. At present these responsibilities are divided among a number of institutions, including the Office of Natural Resources and Environmental Policy and Planning (ONEP), the Thailand Greenhouse Gas Management Organization (TGO), and King Mongkut's University of Technology Thonburi. The scoping suggested that having in place one institution in charge of leading and coordinating a national measurement and performance-tracking system would provide clarity and improve coordination (TGO 2012).

The South African scoping exercise also found that coordination could be strengthened (Boyd et al. 2011). A variety of actors and institutions contribute to the country's measurement and tracking system; respondents, however, thought the system lacked coordination. At present the Department of Environmental Affairs (DEA) is establishing a dedicated measurement and evaluation unit to lead coordination and management. The scoping found that coordination among international donors supporting work related to the measurement and tracking of GHG emissions is as important as coordination within the government. Scoping respondents suggested that the DEA create a small project steering group to avoid duplication by donors (Boyd et al. 2011).

3.3.6 Human resource capacity

Another challenge faced by a number of the MAPT countries is the lack of sufficient human resource capacity to effectively implement a nationwide measurement and tracking system. This need manifests itself in a number of ways, including insufficient numbers of staff, staff not having the requisite skills or technical expertise, and an inability to hire and retain staff.

In Colombia, for example, the scoping found that financial constraints have resulted in personnel gaps within institutions, as the institutions are unable to hire permanent staff or experts tasked solely with undertaking MRV work (Mogollón Duffó et al. 2011b). In addition, respondents felt there was a general lack of training and expertise available across climate change-related positions, including the design, implementation, operation, and use of MRV systems.[21] Similarly, in Brazil respondents stated a need for additional staff capacity dedicated specifically to MRV functions (Osório and Piva 2011). Currently, MRV-related responsibilities are added to regular staff duties.

In Ethiopia, human resource challenges were also prevalent and many interviewees expressed a need for additional capacity building to increase the numbers of staff with the skills and expertise required to initiate or maintain an MRV system (Fikreyesus et al. 2011). Scoping revealed that currently no staff members are dedicated to monitoring GHG emissions in the relevant institutions; however, the Ethiopian Government is creating a dedicated MRV unit within the country's new Ministry of Environment and Forests (MoEF).[22] Technical knowledge in tracking GHG emissions was also found to be limited. In particular, the scoping respondents called for trained staff at the national, subnational, and sectoral levels in order to support on-the-ground data collection. The scoping exercise also found there to be no institutional mechanism directed at providing training on a sustained basis. Respondents emphasized that the few training activities implemented were ineffective in building long-term capacity due to the short length of the training and lack of support and follow-up after activities (Fikreyesus et al. 2011).

In Thailand, the scoping also found that technical expertise around GHG monitoring and reporting could be strengthened (TGO 2012). Similarly, in South Africa the scoping revealed the need for additional staff training and capacity building across a number of areas, including data collection and management within governmental agencies and departments. Respondents also indicated a need for training and capacity building for South African National Accreditation System (SANAS) accredited monitoring and verification personnel, for experts on GHG emissions management, and for the country's relevant statisticians (Boyd et al. 2011).

3.3.7 Conclusion

To effectively reduce GHG emissions, a country must have institutions with the capacity to successfully measure and manage emissions. Many developing countries and emerging economies are currently contending with the challenge of either developing a whole new system for the measurement and tracking of GHG emissions and policy impacts or alternatively integrating this new function into existing institutional arrangements and systems.

Countries are working to build domestic capabilities in order to improve the MRV system. These key institutional functions and capacities include the ability to design effective institutional arrangements, to improve processes and coordination mechanisms, to foster leadership and management capabilities, and to designate clear roles, responsibilities, and mandates. In addition, the corresponding human resource capacity must be built within institutional systems. The capacity and skills of individual staff members, including managerial and technical abilities as well as recruitment and retaining are all essential to ensure the effective functioning of a country's measurement and tracking system.

Based on the findings of the scoping activities, WRI is implementing a series of research-based capacity-building activities to support institutional capacity building in MAPT countries and beyond. For example, in South Africa, WRI is working with the Energy Research Center (ERC) at the University of Cape Town to develop a framework that outlines the key institutional functions, roles, and mandates necessary for an effective GHG measurement and performance-tracking system.

Finally, as part of the MAPT project, the ERC is undertaking a series of case studies highlighting different institutional models for measurement and performance tracking in developed and developing countries to showcase lessons learned and means for overcoming institutional capacity gaps. The first set of case studies focuses on the domestic MRV of specific NAMAs and the institutions required to implement them, as well as the MRV of non-GHG aspects of mitigation actions (e.g., sustainable development cobenefits). The ERC is also studying effective models for multilevel governance of MRV from international to national and local institutions.

3.4 MITIGATION ACCOUNTING: TRACKING THE EFFECTS OF POLICIES AND GOALS

DAVID RICH AND JARED FINNEGAN

3.4.1 Executive summary

This section outlines key findings related to one critical aspect of GHG measurement and performance tracking: accounting for emissions reductions associated with mitigation actions and policies and mitigation goals. In addition to research conducted in MAPT countries, the research findings presented in this section reflect inputs from more than 25 non-MAPT countries.

Box 3.1 | **Key findings**

- Survey participants in more than 25 countries identified a need to (1) quantify GHG reductions from mitigation actions and policies and (2) track performance toward mitigation goals.
- Quantifying GHG reductions from mitigation actions and policies and tracking performance toward mitigation goals are useful to meet a variety of objectives, including informing mitigation strategies, tracking policy effectiveness and performance, reporting progress toward goals, and building support for mitigation actions.
- Countries have limited experience accounting for mitigation actions and policies, and current practices lack consistency and transparency.
- Countries identified a clear need for new international guidelines for both quantifying GHG reductions from mitigation actions and policies, and tracking progress toward national and subnational mitigation goals.
- In order to implement future guidelines, many countries and subnational jurisdictions will need to build capacity in several areas, including:
  - developing systems and institutions for collecting data from GHG sources to track the effects of mitigation actions and goals;
  - developing technical knowledge needed to apply guidelines and implement data collection systems;
  - implementing databases and tools (e.g., software systems) for collecting and managing data; and
  - accessing financial resources to implement new data collection systems and methodologies.

3.4.2 Introduction

Many countries are developing and implementing GHG emissions reduction goals, low-emissions development strategies (LEDS), nationally appropriate mitigation actions (NAMAs), and other programs and policies designed to mitigate GHG emissions while facilitating socioeconomic development. Monitoring and evaluating the effectiveness of these mitigation actions, policies, and goals requires that countries and subnational jurisdictions have in place appropriate systems to account for GHG reductions achieved through individual mitigation actions and policies and to track progress toward overall GHG reduction goals. See Box 3.2 for definitions of mitigation actions and policies and mitigation goals.

National and subnational GHG inventories are critical for enabling governments to track changes in overall GHG emissions at the jurisdiction level. All jurisdictions should develop a GHG inventory as a first step to managing GHG emissions, following established standards such as the *IPCC Guidelines for National Greenhouse Gas Inventories*. Quantifying the GHG effects of individual mitigation actions, policies, and goals enables governments to achieve additional GHG management objectives, such as:

- **informing mitigation strategies** by understanding the expected GHG effects of actions, policies, and goals;
- **tracking performance** of actions and policies and **tracking progress** toward GHG reduction goals;
- **reporting** on GHG effects of mitigation actions and reporting on progress toward goals to domestic or international audiences; and
- **facilitating support** for mitigation actions (e.g., NAMAs) based on quantification of GHG reductions

Mitigation accounting for policies and actions requires developing a baseline scenario of what would have happened in the absence of the specific policy or action. See Figure 3.1 for an illustration of quantifying GHG reductions from a mitigation action or policy relative to a baseline scenario. See Figure 3.2 for an illustration of tracking progress toward a GHG reduction goal.

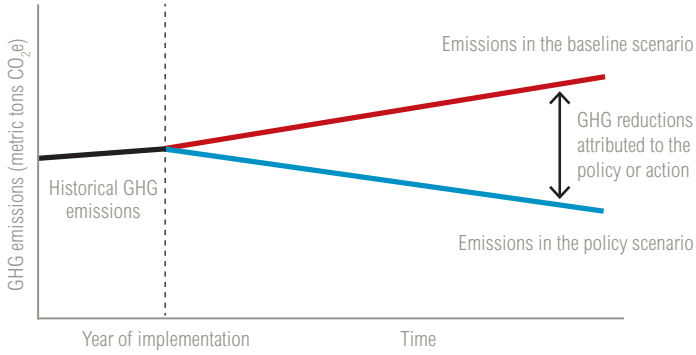
Box 3.2 | **Definitions**

Mitigation accounting refers to accounting for GHG reductions from policies and actions and mitigation goals.

Policies and actions are interventions taken or mandated by a government, institution, or other entity, and may include laws, regulations, and standards; taxes, charges, subsidies, and incentives; information instruments; voluntary agreements; implementation of new technologies, processes, or practices; public or private sector financing and investment, among others. This definition excludes individual projects, since project-based accounting is addressed by project-level methodologies such as those provided by the Clean Development Mechanism (CDM) or the GHG Protocol for Project Accounting.

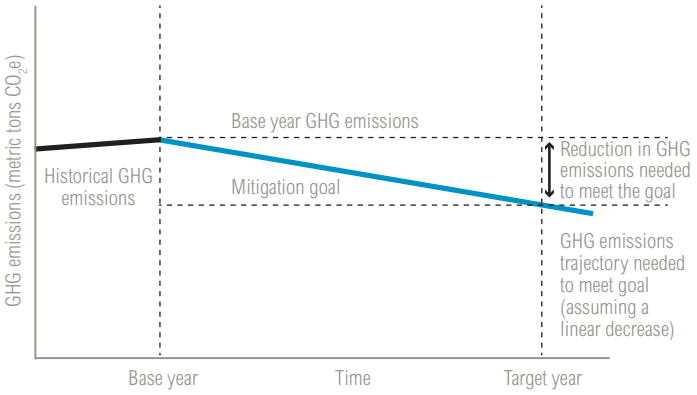
Mitigation goals indicate a desired level of GHG emissions reductions (or GHG emissions reduction per unit of output, such as GDP) within a given jurisdiction. Goals can take the form of GHG reductions from a base year, GHG reductions from a baseline scenario, reductions in emissions intensity, or reductions to a fixed emissions level (e.g., zero in the case of carbon neutrality).

Figure 3.1 | **Quantifying GHG reductions from a mitigation action or policy**



Source: WRI

Figure 3.2 | **Tracking progress toward a GHG reduction goal[23]**



Source: WRI

3.4.3 Research approach

In addition to the research approach outlined in Section 2.3, WRI conducted an online survey of more than 300 international experts and stakeholders on the need for new GHG accounting guidelines for mitigation actions and policies and mitigation goals. More than 100 participants from over 20 countries responded.[24]

WRI also convened four workshops (with approximately 100 participants in all) to understand the need for mitigation accounting and related technical challenges. The workshops were held in the following locations during the following months:

- San José, Costa Rica (April 2011);
- Rio de Janeiro, Brazil (August 2011);
- Durban, South Africa at COP17 (December 2011); and
- New Delhi, India (March 2012).

3.4.4 Research findings

This subsection describes the main research findings from the in-country interviews, the online survey, and the workshops. The results are organized around three related topics: the need for new mitigation accounting guidelines, the objectives of mitigation accounting, and capacity requirements to carry out mitigation accounting.

NEED FOR NEW MITIGATION ACCOUNTING GUIDELINES

Of the respondents in the online survey, 97% said GHG reductions from mitigation actions and policies should be measured, while 90% said GHG reductions should be both measured and reported, and 94% saw a need for new guidelines on how to account for the GHG effects of mitigation actions and policies to promote more consistency and transparency. In addition, 84% of respondents said new guidelines are needed for tracking progress toward GHG reduction goals.

The in-country interviews conducted in Brazil, Colombia, Ethiopia, India, and Thailand, as well as the workshops, revealed a similar need for new guidelines for measuring GHG reductions from mitigation actions and policies. Participants were not aware of existing methods or guidelines for measuring GHG reductions from mitigation actions and policies other than project-based methodologies such as those developed under the CDM. As a result, survey participants in each country supported the development of new guidelines that explain how to quantify GHG reductions from mitigation actions and policies that are larger than individual projects (see Table 3.4).

OBJECTIVES OF MITIGATION ACCOUNTING

In-person interviews in five countries[28] revealed a variety of objectives that could be achieved by tracking progress and quantifying the GHG effects of mitigation actions, policies, and goals. Table 3.5 provides a summary of their responses.

Table 3.4 | **Summary results from in-country interviews on need for new guidelines for mitigation actions and policies**[25]

COUNTRY	IS THERE A NEED TO MEASURE GHG REDUCTIONS FROM MITIGATION ACTIONS AND POLICIES?	DOES YOUR COUNTRY HAVE EXPERIENCE MEASURING GHG REDUCTIONS FROM MITIGATION ACTIONS AND POLICIES?[26]	ARE THERE EXISTING METHODS OR GUIDELINES FOR MEASURING GHG REDUCTIONS FROM MITIGATION ACTIONS AND POLICIES?[27]	IS THERE A NEED FOR NEW VOLUNTARY GHG ACCOUNTING GUIDELINES FOR MITIGATION ACTIONS AND POLICIES?
Brazil	Yes	Some	No	Yes
Colombia	Yes	No	No	Yes
Ethiopia	Yes	No	No	Yes
India	Yes	Some	No	Yes
Thailand	Yes	No	No	Yes

Table 3.5 | **Objectives of tracking GHG effects of mitigation actions, policies, and goals**[29]

COUNTRY	OBJECTIVES OF TRACKING GHG EFFECTS OF MITIGATION ACTIONS, POLICIES, AND GOALS
Brazil	■ Monitor domestic climate change programs such as the National Policy on Climate Change ■ Help the country position itself domestically and internationally to monitor sectoral plans and to develop a public registry of mitigation policies and quantifiable commitments ■ Measure emissions in order to manage them ■ Enable comparison of GHG reduction results between countries
Colombia	■ Know whether policies are effective and contributing to a low-carbon economy ■ Understand the effectiveness of government policies and programs ■ Identify mitigation opportunities ■ Standardize the methodologies for monitoring, reporting, and verification of actions and/or projects in accordance with the economic and environmental characteristics of each country ■ Report domestically and internationally on meeting environmental goals ■ Access carbon markets and financing ■ Inform policy design
Ethiopa	■ Understand achieved reductions, identify problems, seek solutions, and achieve planned goals and objectives ■ Satisfy verification demands of the international community ■ Use data on emissions reductions to participate in programs like the CDM ■ Track progress toward the low-carbon development goals of the Climate-Resilient Green Economy (CRGE) plan ■ Help non–Annex I countries understand their performance related to GHG abatement ■ Understand whether countries have honored their pledges ■ Contribute to global emissions reductions
India	■ Inform domestic decision making for policies being planned and implemented ■ Facilitate international reporting of the impact of policies in biennial reporting and national communications ■ Ensure efficient use of international financial support for implementation of mitigation actions and policies (e.g., supported NAMAs)
Thailand	■ Inform mitigation strategies ■ Understand the effectiveness of mitigation policies ■ Enable consistent tracking of mitigation action plans

Participants in the online survey and workshops expressed similar views and identified the following objectives for mitigation accounting:

- **Decision making:** to help design low-carbon policies to meet GHG reduction goals and understand which actions and policies are effective
- **Performance tracking:** to evaluate the effectiveness of mitigation actions after implementation and track progress toward GHG reduction goals
- **Reporting:** to ensure transparency in reporting the GHG effects of mitigation actions, policies, and goals
- **Facilitation of support:** for mitigation actions and NAMA-based financing or crediting

CAPACITY REQUIREMENTS TO CARRY OUT MITIGATION ACCOUNTING

As evidenced by the scoping research, many countries need to build capacity to quantify and report the GHG effects of actions and policies and track progress toward mitigation goals. The in-country interviews, online survey, and workshops revealed that governments need several types of capacity to understand and quantify the GHG effects of mitigation actions and policies and track progress toward mitigation goals, including:

- guidelines for tracking progress and quantifying the GHG effects of mitigation actions, policies, and goals;
- a lead institution responsible for coordinating measurement and performance tracking of actions, policies, and goals;
- systems and institutions, with mandates and skilled staff, responsible for collecting data from various GHG sources;
- a legal framework or mandate that outlines clear institutional roles and responsibilities related to performance tracking of mitigation actions, policies, and goals;
- technical knowledge on how to apply guidelines or methodologies and implement data collection systems;
- databases and tools (e.g., software systems) for collecting and managing data; and
- financial resources to implement new data collection systems and methodologies.

3.4.5 Planned activities

In order to respond to the mitigation accounting capacity needs outlined by the scoping research, WRI has begun work to develop two new Greenhouse Gas Protocol[30] standards:

- **Policy and Action Standard**: how to quantify GHG reductions and track and report progress from climate change mitigation actions and mitigation policies
- **Mitigation Goals Standard**: how to quantify GHG reductions and track and report progress toward national, subnational, and sectoral GHG reduction goals

The findings from the abovementioned research were used to define the scope and topics included in the standards. Therefore, the new standards will be voluntary, policy-neutral, and designed to meet a variety of country objectives identified by the scoping research.

WRI has developed the standards through an inclusive, global, multistakeholder process, which includes participants from the scoping surveys as well as additional experts and stakeholders from more than 40 countries. The first drafts, completed and available for stakeholder review in late 2012, were pilot tested in over 20 countries during 2013. The final standards will be published in July 2014. Following publication, WRI plans to conduct a series of training workshops in 2014 to help users implement the standards. For more information on the process to develop the standards, please visit http://www.ghgprotocol.org/mitigation-accounting.

The new guidelines and associated capacity-building activities are expected to support and help build the capacity of governments and other actors to more effectively meet their low-carbon development goals.

3.5 NATIONAL GHG EMISSIONS INVENTORIES

THOMAS DAMASSA, SAMAH ELSAYED, AND SOFFIA ALARCÓN DÍAZ

3.5.1 Executive summary

This section presents a brief summary of the MAPT scoping research findings associated with one critical aspect of GHG measurement and performance tracking: national GHG inventory systems. A national GHG inventory is essential to assess progress toward national goals, and all countries included in this study have made or are making significant investments in their national inventory systems. The examples discussed here demonstrate similarities in the nature of remaining capacity challenges facing countries trying to improve their national GHG inventory systems, for example: the need for strong institutional arrangements; additional personnel and technical expertise; and robust systems for aggregating, storing, and archiving data and other relevant inventory information. Capacity challenges for national inventory systems, however, are also strongly influenced by the country context.

Based on these scoping results, the MAPT project is undertaking several activities to support capacity building for national GHG inventory systems, including the development of a series of case studies to highlight country experiences and share lessons learned regarding national inventory management.

3.5.2 Introduction

This section synthesizes the capacity needs findings of MAPT scoping research related to national GHG emissions inventory systems. A national GHG inventory provides critical information regarding a country's emissions profile and can be an important contributor to the assessment of progress toward national and/or sectoral policy goals. The creation of national GHG inventories is primarily driven by country reporting obligations under the UN Framework Convention on Climate Change (UNFCCC).[31] However, in addition to producing information to support the UNFCCC process, a national GHG inventory system is increasingly becoming an important policy intervention to drive several nonclimate domestic activities (e.g., energy data management) or policies.

WRI's research seeks to describe the specific capacity challenges facing six countries in developing national GHG inventory systems as an important first step to supporting capacity-building activities. This analysis also builds on and complements existing assessments of national GHG inventory systems (e.g., Mintzer et al. 2010), other syntheses of capacity needs for GHG inventories,[32] and recommendations for improving national GHG inventory systems and reporting (e.g., Breidenich 2011; Fransen 2009).

Lastly, it is important to mention that GHG measurement and performance tracking is very much an emerging practice. Therefore, virtually all countries have some related capacity needs. This section uses in-country scoping research to elucidate capacity needs and opportunities, which are both country-specific and relevant across countries, developed and developing.

3.5.3 Results of national GHG inventory capacity needs assessments

Although beyond the scope of this report, efforts made to date by countries (and not only those included in this research) represent a wealth of experience countries can draw from when seeking to establish or improve national GHG inventory systems. Countries that have produced two or more national GHG inventories often have already established significant institutional, human, and technical capacity on which to build and further develop their national inventory system. These successes are critical in moving toward a robust, sustainable national inventory management system that can support reporting obligations and inform domestic policy.

The findings of the country scoping reports related to national GHG inventory systems demonstrate remaining capacity challenges. General capacity challenges identified in multiple countries include a need for

- long-term institutional support and formal agreements that describe coordination of contributing organizations and agencies;

- sufficient and well-trained personnel; and
- robust technical systems to regularly collect and use data and document and archive relevant inventory information, particularly in the land use, land use change, and forestry (LULUCF) sector.

The summaries below provide illustrative, country-specific examples from the MAPT focus countries for categories of capacity needs identified in the scoping research: human resources, institutions, information and technology, and financial resources (see Table 2.1). The latter is discussed in relation to identified human resource capacity challenges, although it is important to note that for several countries remedying the capacity gaps will require addressing financial resource constraints. More detail regarding these capacity needs can be found in the original country scoping reports (available online at http://www.wri.org/our-work/project/measurement-and-performance-tracking-developing-countries). Additional examples of capacity-building needs, as well as examples of successes in capacity development, will be part of the MAPT case study series on national GHG inventory systems (see below).

INSTITUTIONS

South Africa

South Africa has begun significant efforts to enhance the national GHG inventory system and has clearly defined a lead agency—the Department of Environmental Affairs (DEA). The scoping report suggests, however, that there is no formalized system of coordinating data for the national inventory (Boyd et al. 2011, p. 44). For example, although the DEA is responsible for reporting to the UNFCCC, it does not have a mandate over data collection in the energy sector.[33] The authors of the South Africa report suggest that coordinating the collection and provision of inventory-relevant data efforts under government guidance—through "a strong mandate" (Boyd et al. 2011, p. 50) or the development of guidelines and/or standards (Boyd et al. 2011, p. 47)– would likely help avoid duplication of efforts and double counting of data.

Thailand

Thailand has successfully completed two national GHG inventories and has several well-established organizations that contribute expertise and resources to the national inventory process. Roles, however, need to be clarified and an institutional framework created that designates an organization as fully in charge of coordinating national GHG information (TGO 2012, p. ii). Currently the Office of National Resources and Environmental Policy and Planning (ONEP) and the Thailand Greenhouse Gas Management Organization (TGO) have purview over the GHG inventory system,[34] with technical support from the King Mongkut's University of Technology Thonburi for activity data compilation, management, and GHG emissions analysis. Scoping research found, however, that no official organization acts as GHG inventory and registry coordinator (TGO 2012, p. 17). As a result, "competences are divided among different institutions in different ministries" and the "level of awareness, knowledge and institutional capacity [...] varies widely" (TGO 2012, p. 4). The authors of the Thailand report suggest that the country's inventory management system would be greatly strengthened by an institutional framework that designs or establishes clear mandates for a new organization with authority over the GHG information system (TGO 2012, p. ii).

FINANCIAL AND HUMAN RESOURCES

Brazil and Colombia

Brazil has strong technical expertise with respect to national GHG inventories. As a result, the country's second national communication provides a comprehensive GHG inventory for the years 1990–2005.[35] Yet, according to the Brazil scoping research, the lack of available financial resources is among the challenges in retaining personnel capacity (Osório and Piva 2011, p. 29). Respondents noted that ministries involved in the preparation of the national GHG inventory "have no permanent teams, and the ones they have are often reduced" (Osório and Piva 2011, p. 17). In addition, the existing qualified human resources are often "not hired directly to monitor and report emissions, but are required to do that on top of their original obligations, which overloads them" (Osório and Piva 2011, p. 10). Survey respondents suggest that the governance structure must be improved (Osório and Piva 2011, p. 11) to retain staff and guarantee the continuing accumulation of knowledge and information. Indeed, where personnel changes were minimal in the national inventory process, the reporting sectors increased their capabilities (Osório and Piva 2011, p. 17).

Similarly, in Colombia, the lack of sufficient funds was identified as a capacity constraint that can preclude the retention of skilled personnel, "creating weaknesses in terms of human capacity and continuity of the processes" (Mogollón Duffó et al. 2011b, p. 32). As a result, there is the "need of professionals trained in the development of GHG inventories" (Mogollón Duffó et al. 2011b, p. 32).

Ethiopia

In Ethiopia, most government agencies do not have dedicated staff to perform national inventory-related activities. Generally, "tasks associated with GHG emissions usually fall on climate change experts" (Fikreyesus et al. 2011, p. 8), who carry out related activities on top of their regular workload. Besides the "absence of permanent skilled personnel, there is currently no training mechanism to provide effective training" (Fikreyesus et al. 2011, p. 8). Occasional workshops have not provided the depth, follow-up, and practical application to truly build capacity. The transition of institutional authority for the compilation of the national GHG inventory from the National Meteorology Agency to the Environmental Protection Authority, along with a significant time lag since the development of their first national inventory a decade ago, has resulted in a loss of much institutional memory and technical expertise. Ethiopia needs to develop a new national inventory system and opportunities for human resource capacity building.

INFORMATION AND TECHNOLOGY

India

India has more than 20 years of experience producing national GHG inventories, and has developed considerable technical expertise and well-defined institutional arrangements for data collection. The scoping research found, however, that additional harmonization and centralization of reported data from the various institutions and sources would improve the national inventory process (ABPS 2011, p. 23). In short, there is a strong interest in a central, comprehensive database (ABPS 2011, p. 15) for collecting and archiving all types of emissions-related data across different sources and sectors on an ongoing basis. Indeed, India's inventory practitioners recognize that a formalized inventory management system (ABPS 2011, p. 15) is critical. For example, in addition to the scoping report, multiple government reports identify as a national priority the development of a national GHG inventory management system (NGIMS) for archiving, updating, and producing information on activity leading to GHG emissions or removals (ABPS 2011, pp. 33–34; MoEF 2010; PC 2011). As envisioned, the NGIMS would include a database for archiving relevant activity data, emissions factors, and documentation to support the development of time series, quality assurance procedures, and strategies for managing uncertainty (ABPS 2011, p. 33; MoEF 2010). In addition to the database, the Indian Government also plans to develop new guidance for harmonizing data collection and information systems for measuring and monitoring GHG emissions.

Ethiopia, South Africa, and Colombia

For sectors like LULUCF, strengthening technical capacities, including monitoring, data collection and management systems, and country-specific emissions factors, is critical to increase the quality of the national GHG inventory report and particularly important for countries where the LULUCF sector is a large emissions source or sink. Information and technology capacities (with linkages to institutional, human resource, and financial resource capacities) relevant to this sector were highlighted in the scoping reports of several countries. For example, in Ethiopia activity data are not easily accessible due to the lack of adequate monitoring systems. The scoping report found the absence of a centralized archiving system to collect, share, and store data with subregional agencies to be a key issue (Fikreyesus et al. 2011, p. 6). This is consistent with the experience in South Africa, where the DEA has underscored the need to strengthen technical capacities to estimate for the agriculture, forestry, and land use (AFOLU) category: "South Africa's current land use dataset is incomplete in both its spatial cover and its coverage of the relevant time period" (DEA 2009, cited in Boyd et al. 2011, p. 41). The scoping reports reveal a need for additional data collection capacity within relevant AFOLU government agencies. Data to report a LULUCF sector inventory also appears to be insufficient in Colombia, where scoping results showed that "there is not a register of satellite images for the complete country" (Mogollón Duffó et al.

2011b, p. 29) and the lead inventory agency—the Institute of Hydrology, Meteorology, and Environmental Studies of Colombia (IDEAM)—could benefit from strengthened tools for the estimates of this sector (Mogollón Duffó et al. 2011b, p. 29).

3.5.4 MAPT activities for the national GHG inventory component

WRI is currently working with in-country partners, including national inventory practitioners, to carry out activities and develop products that can support capacity-building efforts for national GHG inventory systems in developing countries. Building on the research summarized in this report, the MAPT project is developing a set of case studies to better understand specific capacities critical to national GHG inventory systems. These case studies highlight the experiences of both developed and developing countries, elucidating good practices, as well as capacity challenges—and how they have been overcome—in national inventory development and management. Topics for the case studies include: [36]

- **Management and coordination of the national GHG inventory process by the lead institution**. This case study series looks at the capacities associated with a central lead inventory agency, as well as those related to establishing and maintaining relationships with other government institutions relevant to compiling a national inventory.
- **Initiating a national inventory system and making it sustainable.** This case study series explores the core capacities required to initiate a formal and comprehensive national inventory system. It also examines ways to ensure the model is sustainable.
- **Producing a national GHG inventory for the land use, land use change, and forestry sector.** This case study series focuses on creating an inventory for the LULUCF sector, one of the most difficult sectors for which to compile a robust inventory of GHG emissions.

The case studies can be found at http://www.wri.org/our-work/project/measurement-and-performance-tracking-developing-countries. Our hope is that they will facilitate cross-country learning among practitioners, support domestic capacity building, and inform the international community of the good practices and challenges associated with developing national GHG inventory systems.[37]

The development of a national GHG emissions inventory is an essential first step to mitigating climate change and meeting national emissions reduction policy goals. It enables a country to identify major GHG sources nationally and sectorally, as well as emissions trends, and can inform low-carbon development strategies. This section and the MAPT project's continued work in this area seek to improve understanding of the capacities that countries require to build a robust national GHG inventory system and bring out best practices. By working in close collaboration with in-country partners, WRI hopes to pursue research and develop tools that will help national governments, funders, and the international community better understand the specific capacities associated with developing a national GHG inventory and support capacity building for more sustainable and efficient national inventory systems.

3.6 CIVIL SOCIETY CAPACITY TO MONITOR POLICY IMPLEMENTATION

DAVIDA WOOD AND BHARATH JAIRAJ

3.6.1 Executive summary

This section presents a brief summary of the capacity needs for tracking policy implementation by civil society, drawing on the results of assessments carried out with partners under the MAPT project in India and South Africa. The country examples illustrate gaps in two critical capacity categories: information and technology, and financial resources (see Table 2.1).

Based on these scoping results, the MAPT project plans to design suite of tools that will enable the tracking of climate and energy policy implementation by civil society. This will be supported by additional capacity-building activities that will facilitate identification of the barriers to the implementation process.

3.6.2 Policy implementation and civil society's role in tracking it

In order for countries to transition to a low-carbon trajectory, policy intervention will be necessary (Stern 2007). Yet putting policies in place is not sufficient to ensure that policies achieve their intended results. Once climate policies have been adopted, countries must select a policy instrument that is appropriate to the context and the problem, a policy design that addresses considerations such as cost-effectiveness and distributional impacts, and robust and adequately resourced institutions. The design and execution of the policy implementation process is key. A coherent set of institutional arrangements needs to be deployed. Effective implementation will require political leadership, coordination, and consultation, as well as financial resources and technical expertise.

The "implementation deficit" that separates laws on the books from their intended effects on the ground is well documented in a number of policy sectors (Makinde 2005). This "deficit" has been called "one of the major problems confronting developing nations" (Makinde 2005, p. 65) and more recently has been identified as a barrier to climate policy effectiveness in developed countries as well.

Monitoring of policy implementation is a function of government. Executive departments or independent agencies charged with implementation typically have internal monitoring systems, and these may in turn be required to report to oversight bodies, such as general auditors or parliamentary or legislative committees. However, the reports generated as a result of these processes are not necessarily routinely available to the public.

Civil society organizations can play an important role in promoting transparency around government reports and in generating independent analysis and oversight. This role is important for reasons of political process—for example, to build public confidence and stakeholder buy-in—and for practical purposes of gaining technical expertise and nontechnical information that can aid in improving policy design and effectiveness. Independent studies conducted by research institutes, professional and labor associations, or nongovernmental organizations may use different analytic frameworks, assumptions, and data sets than those of official government studies.

If independent studies confirm government conclusions, this creates credibility and buy-in from stakeholders. If their conclusions differ, they provide alternative and potentially equally valid points for consideration during policy design and review processes.

In either case, civil society monitoring and engagement can address the implementation deficit by drawing attention to delays and progress and providing independent analysis of underlying reasons as well as recommendations for improvement. Increased transparency and stakeholder engagement can provide critical inputs for improved policy design and delivery of results.

3.6.3 Research approach and findings

For research under this component, WRI was able to leverage existing partnerships with the Electricity Governance Initiative (EGI) in several of the MAPT countries to conduct in-depth interviews on the implementation of climate-related electricity policy. The EGI, a network of civil society organizations dedicated to promoting transparent, inclusive, and accountable decision making in the electricity sector, has been active in India and Thailand since 2002 and in South Africa since 2009.[38] Interviews conducted on scoping trips provided information about civil society capacity-building needs and interests as it pertained to tracking policy implementation.

In India, South Africa, and Thailand, governance assessments had previously been conducted using EGI's Electricity Governance Indicator Toolkit. While the assessments yielded useful information about governance gaps in electricity sector decision-making processes, feedback from partners indicated that the methodology was skewed toward gaps in legislative and regulatory decisions. By contrast, assessment of policy implementation had been neglected. EGI partners' deep involvement with national institutions pointed to the realities of implementation deficits and the need for tools that would help stakeholders understand the key ingredients of effective policy implementation and offer systematic guidance in addressing them.

Of the countries surveyed, it was decided by the MAPT team that the civil society role could be especially pivotal in South Africa and India at this time.[39] Both countries have carbon intensive electricity sectors (the sector contributes 47.6% and 35.5% of total CO_2 emissions in South Africa [National Treasury 2010] and India [Ramachandra 2012], respectively), and civil society had been actively engaged in advocating for a shift to low-carbon strategies. For example, in South Africa, Idasa, a policy research institute focused on democratic government, had previously led a working group of civil society organizations of academics, energy researchers, environmentalists, and labor researchers assessing electricity sector governance in South Africa using the EGI methodology. The assessment drew attention to key governance gaps in the electricity sector and mobilized civil society around the Integrated Resource Plan (IRP) process, the national long-term electricity plan being developed during 2009–10. As a result, the public participation process increased the share of renewable energy almost 50% above the share envisioned in the draft IRP.[40]

Because of India's federal structure, size, and varied geography, both the central and state governments develop renewable energy and energy efficiency policies. For implementation, however, much of the responsibility is entrusted to the state governments, even where the policies are developed by the central government. Therefore, to examine implementation challenges of national and state policies on energy, and specifically on demand-side management (DSM) policies, energy efficiency, and renewable energy, it was decided by the MAPT team to use states as the unit of analysis. The civil society partner in India is PMGER/Chetana Society, a policy research association with a strong grassroots constituency.

A separate scoping trip was made by WRI to South Africa, where WRI has worked with civil society on constructive engagement with key government institutions in the electricity sector since 2008. During the scoping trip, EGI partners expressed the need for a tool that could be used to monitor whether the increase in renewable energy uptake anticipated in the IRP process would be implemented.

Overall, the desk research and in-depth interviews identified two key categories of capacity needs especially relevant to support civil society in tracking policy implementation in India and South Africa: information and technology capacities (e.g., technical tools or methodologies for tracking climate policy implementation) and financial resources to support sustained engagement.

INFORMATION AND TECHNOLOGY CAPACITIES

In both countries freedom of information laws exist. In South Africa, civil society has regularly used the Public Access to Information Act to obtain data not proactively disclosed, but institutions have also used the act to block access. In India, the Right to Information Law requires that data be furnished proactively at both the federal and state levels.

Nevertheless, the energy sector is historically opaque. Documents clearly presenting implementation milestones, such as regular progress reports and periodic evaluations, are generally not systematically available to the public. In addition, data on the inputs needed for effective policy implementation, such as legal mandates, financial support, technical expertise, and capacity for stakeholder engagement would be necessary to meaningfully analyze strengths and weaknesses. However, even when this information is available, the government's inability to target communication to specific groups sometimes makes that communication ineffective. Often, it makes available more information than is needed.

FINANCIAL RESOURCES

Despite the presence in both countries of a fairly robust civil society with adequate technical expertise, research partners said the lack of funding for building greater civil society capacity in this space was a major gap. A global survey and analysis conducted by the U.S. National Association of Regulatory Utility Commissioners (NARUC) supports this claim (NARUC and USAID 2006). An earlier WRI policy paper (Weischer et al. 2011), which argued for effective financial support to help developing

countries transform their energy sectors, identified the need for country-specific packages that include support to civil society organizations, thus facilitating deeper and broader participation in energy policymaking and planning processes.

3.6.4 MAPT activities for the policy implementation component

Based on the capacity gaps identified in the scoping phase and outlined in the previous subsection, a set of activities is being undertaken that aim to equip civil society in India and South Africa[41] to track policy implementation. In India, the project team, working with PMGER/Chetana Society, has decided to focus on tracking key energy policy implementation in the state of Andhra Pradesh. In South Africa, working with partners, the MAPT project is monitoring the success of South Africa's new renewable energy procurement mechanisms as well as its Integrated Resource Plan (IRP) process.

The MAPT project proposes to support this endeavor with tools for seeking, organizing, and analyzing data for tracking and monitoring policy implementation. These tools could be used to engage government and private-sector stakeholders and build a common language for improved monitoring and review processes.

During the scoping phase, WRI and partners developed and partially piloted a policy implementation tool outline. Although this tool emerged from a focus on electricity sector issues, it is designed to be policy neutral[42] and aims to facilitate the tracking of implementation of key climate and energy policies. As a result of stakeholder feedback, three types of tools seem necessary to effective monitoring of policy implementation:

1. **Tracking framework:** a guide to identifying the steps that public institutions would need to follow to implement a particular policy
2. **Diagnostic framework:** an in-depth framework for examining and diagnosing institutional barriers to policy implementation
3. **GHG Protocol Policy and Action Standard:** methodology to quantify GHG impacts of implemented policies (this guidance is being developed in parallel by another component of the MAPT project) (see Section 3.4)

Over the course of the MAPT project, WRI is developing and refining these tools and supporting partners in strategic use of the results of the assessments. As appropriate, WRI will develop templates and support partners in developing case studies on their experience using the policy implementation tools.

As the scoping desk research and interviews demonstrated, neither India nor South Africa lacks the capacity and creativity for effective policymaking. Regardless of how well they are written, however, the policies will not achieve their goals unless they are effectively implemented. Through the set of activities listed above and the policy implementation tools developed, we hope that civil society organizations, and eventually other actors, in the two countries will be able to track the implementation of key climate and energy policies, enabling them to better address stumbling blocks and impacts of implementation. This could, in turn, help bridge the gap between policy design in the books and its implementation on the ground, thereby bringing both countries closer to their low-carbon developmental goals.

4. RESEARCH FINDINGS BY COUNTRY

This chapter presents the findings for each of the six countries—Brazil, Colombia, Ethiopia, India, South Africa, and Thailand—included in the scoping research. The research approach for this chapter is described in Section 2.3. In each section, an overview of key climate policies and institutions is provided, followed by an overview of capacity needs and priorities.

4.1 BRAZIL

SAMAH ELSAYED

4.1.1 Executive summary

This section presents a summary of climate-related policies and institutions and select capacity needs related to greenhouse gas (GHG) measurement and performance-tracking systems in Brazil. It synthesizes the results of research assessments carried out by WRI's in-country partner, the Getúlio Vargas Foundation Center for Sustainability Studies (FGVces), as part of the MAPT project.

4.1.2 Brazil's MRV landscape: Policies and institutions

Brazil is ranked among the five largest emitters of greenhouse gases (GHGs) in the world. This is largely due to the importance of the country's agricultural and land use change (LUC) sectors. Brazil's LUC emissions originate primarily from clearing of the Amazonian and Cerrado biomes, driven in large part by the rapid expansion of agricultural frontiers and agrarian speculation. Thanks to the efforts of the Brazilian Government, however, deforestation rates have been dropping steadily since the mid-2000s.

In 2009 Brazil passed a law creating the National Climate Change Policy. Among other priorities, this policy established domestic targets for the reduction of projected greenhouse gas emissions by between 36.1% and 38.9% by 2020. In order to implement these voluntary emission reduction targets, the Brazilian Government proposed distributing quotas by sector and mitigation action. Tracking progress toward meeting the sectoral targets outlined in this plan requires an effective domestic MRV system spanning agencies, sectors, and states. The law requires that these mitigation actions be quantifiable and verifiable, placing great emphasis on having systems in place for monitoring and tracking the reductions associated with policies.

The policy's targets should be achieved through implementation of the following sectoral plans: (a) the Action Plan to Prevent and Control Deforestation in the Amazon (PPCDAm); (b) the Action Plan to Prevent and Control Deforestation and Fire in Cerrado (PPCerrado); (c) The 10-Year Plan for Energy Expansion (PDE); (d) the Plan for Low-Carbon Agriculture (Plano ABC); (e) the Plan to Reduce Emissions from Steel (Plano da Siderurgia); and (f) the plans for transportation (Plano de Transporte), industry and mining (Plano da Indústria e da Mineração), health (Plano da Saúde), and pisciculture (Plano da Piscicultura). Some of these plans–such as the PPCDAm, the PPCerrado, and the PDE—already existed before the climate policies were published and were updated and included as sectoral NAMAs.

INSTITUTIONAL FRAMEWORK

Within the government, the climate debate in Brazil has been led mainly by the Ministry of External Relations, aided by the Ministry of Science and Technology, and the Ministry of Environment. In the international negotiations, Brazil has innovated by committing to voluntary targets in 2009.

The institutional framework in place for the implementation of the National Climate Change Policy and Plan is currently structured as follows:

Interministerial Committee on Climate Change (CIM): Established in 2007, the main function of the CIM is to support the implementation, monitoring, and periodic evaluation of the National Climate Change Plan. Within the CIM, the Executive Group on Climate Change (GEx) was created to act as the CIM's executive secretariat, assisting in the development, implementation, monitoring, and evaluation of the National Plan on Climate Change as well as development of sectorial plans. The GEx is coordinated by the Ministry of the Environment.

Interministerial Commission on Global Climate Change (CIMGC): The CIMGC is the primary venue for discussing UNFCCC negotiation strategies and approaches within the Brazilian Government. Only governmental representatives have access to its meetings. It is also the national designated authority for the approval of projects for the Clean Development Mechanism (CDM).

Ministry of Foreign Affairs (MRE): The MRE is in charge of representing Brazil in the international forums and at the UNFCCC. It normally convenes stakeholders prior to and during conferences of the parties (COPs) to discuss logistical and substantive issues.

Ministry of Science, Technology, and Innovation (MCTI): In addition to leading all science- and technology-related climate change issues, MCTI plays a role in the international negotiations, supporting the MRE. It also coordinates the CIM and is responsible for compiling the Brazilian Inventory and National Communication. Presidential Decree Nº 7.390/2010, which regulates the National Climate Change Policy, states that the Ministry of Science and Technology will lead the work group responsible for elaborating annual emission estimates, improving the calculation methodology of emission projections, and proposing reviews of the decree itself, when necessary. This ministry created the technical capacity within the federal government for the development of Brazil´s two national communications and inventories. In addition to the national inventory, the MCTI also plays a role in forest monitoring through the National Institute of Spatial Research (FGV 2011, p. 41).

Ministry of the Environment (MMA): MMA is responsible for environmental policy and has created a climate change secretariat that also participates in the international negotiations, offering technical support to the MRE. The MMA leads consultations on the climate change sectoral plans with civil society and other areas of government. It also leads the GEx, which coordinates the current efforts to compile an effective strategy to implement the national climate change policy.

Brazilian Forum on Climate Change (FBMC): FBMC's primary objective is to create awareness and mobilization of Brazilian society on climate change. The FBMC is composed of federal ministers, the president of the National Water Agency (ANA), and other relevant individuals from academia, businesses, and civil society groups. The FBMC is a space to exchange ideas and information on measures being studied by the government for implementation, such as the sectorial plans under the National Climate Change Policy.

Brazilian Network on Climate Change Research (Rede Clima): Rede Clima was established by the Ministry of Science, Technology, and Innovation (MCTI) and the Ministry of the Environment (MMA) for the purpose of generating and disseminating technological knowledge, conducting studies on the effect and impacts of climate change in Brazil and worldwide, and formulating public policy. It is managed by the Brazilian National Institute for Space Research (INPE) and will develop high-level science on climate change.

According to climate change legislation, the process for establishing new public policies in Brazil involves a number of the bodies and ministries discussed.

Table 4.1 | **Process for establishing public policy according to climate change legislation**[43]

1	National Congress stipulated the main principles, guidelines, objectives, and instruments of the National Policy on Climate Change (PNMC).
2	Regulation (further detailing of the policy) is approved by presidential decree.
3	The Office of the President's Chief of Staff coordinates the Interministerial Committee on Climate Change (CIM) that will prepare the content of the regulation (sectoral plans and actions).
4	The Ministry of the Environment (MMA) coordinates CIM's Executive Group (GEx).
5	The Ministry of Science and Technology coordinates the inventory and national communication.
6	The Brazilian Forum on Climate Change monitors the coordination process. It operates as the main area of debate on and access to information of the PNMC.

In January 2010, Brazil communicated to the UNFCCC Secretariat that it intends to adopt the actions in the table below as NAMAs (Brazil 2010a, Brazil 2010b):

Table 4.2 | **Brazil's nationally appropriate mitigation actions**

NAMAs	2020 (BAU $MTCO_2eq$)	RANGE OF ESTIMATED REDUCTION ($MTCO_2eq$)		REDUCTION PROPORTION	
LAND USE	**1084**	**669**	**669**	**24.7%**	**24.7%**
Red. deforestation - Amazon (80%)		564	564	20.9%	20.9%
Red. deforestation - 'Cerrado' (40%)		104	104	3.9%	3.9%
AGRICULTURE	**627**	**33**	**166**	**4.9%**	**6.1%**
Restoration of grazing land		83	104	3.1%	3.8%
Integrated crop-livestock system		18	22	0.7%	0.8%
No-till farming		16	20	0.6%	0.7%
Biological nitrogen fixation		16	20	0.6%	0.7%
ENERGY	**901**	**166**	**207**	**6.1%**	**7.7%**
Energy efficiency		12	15	0.4%	0.6%
Increase in the use of biofuels		48	60	1.8%	2.2%
Increase from hydroelectric P.P.		79	99	2.9%	3.7%
Alternative energy sources		26	33	1.0%	1.2%
OTHERS	**92**	8	10	**0.3%**	**0.4%**
Iron and steel - replacing coal from deforestation to planted forests		8	10	0.3%	0.4%
TOTAL	**2703**	**975**	**1052**	**36.1%**	**39.8%**

Since emissions from land use change and forestry represent a significant proportion of Brazil's emissions portfolio, a number of national policies are being enacted to reduce deforestation and hence the emissions associated with this sector. These include the Action Plan to Prevent and Control Deforestation in the Amazon (PPCDAm), which proposes a reduction in Amazon deforestation of 80% by 2020. In the Cerrado biome, the Action Plan to Prevent and Control Deforestation and Fire (PPCerrado) is in place with a 40% emission reduction goal in 2020 (FGV 2011, p. 41).

In the industry sector, no specific federal level policy or law mandates that companies report their GHG emissions, although the National Climate Change Plan does cite the Brazil GHG Protocol Program[44] as a tool to help companies measure and manage their emissions. The GHG Protocol Program, which has been operating in Brazil since 2008, is one of the most advanced voluntary corporate reporting programs in a major emerging economy.

In addition to the momentum nationally, there is also a focus on monitoring and reporting greenhouse gas emissions at the state level, with many state climate change laws having been passed throughout Brazil. For example, the states of both Rio de Janeiro and São Paulo have enacted some form of mandatory reporting by large companies, while other states, such as Minas Gerais, are also putting in place incentives for corporate reporting.

Other key plans stemming from the National Policy on Climate Change include the 10-Year Plan for Energy Expansion, the Consolidation of a Low-Carbon Economy in Agriculture, and the Plan for the Reduction of Steel Industry Emissions.

4.1.3 Capacity needs

While technical capacity in Brazil is high overall, our scoping activities, which included a combination of in-country meetings, desk research, and a survey of stakeholders conducted by FGVces, also revealed a number of opportunities for Brazil to strengthen its ability to monitor and track greenhouse gas emissions (see Table 4.3).

For example, interviews emphasized the human resource challenges facing a number of key institutions, including the lack of staff dedicated to MRV activities, which are often added on top of their regular responsibilities.

Technical capabilities for monitoring greenhouse gas emissions is especially high in the forestry and land use sector, where Brazil is a global leader in monitoring methodologies. However, interviewees felt that Brazil could further benefit from developing a system that integrates this data and information in an organized way. A number of people from other sectors also highlighted the value of an integrated information system and registry for reporting and collating greenhouse gas data, expressing a need for a technical platform that extends to general data sharing online in order to facilitate the exchange of information, knowledge, technical, and historical data.

The scoping also found that Brazil could benefit from comparable policies, methodologies, and methods of data collection across states, as more Brazilian states pass or consider climate legislation requiring companies to report their emissions. Respondents noted that Brazilian states could learn from the approach other states and countries are taking toward harmonizing reporting efforts.

Table 4.3 | **Select capacity needs in Brazil related to GHG measurement and performance tracking**

CATEGORY	CAPACITY NEED
Institutional	**Institutional leadership and staffing** A number of interviewees highlighted the need for coordination and integration of efforts among the different ministries at the federal level and harmonization of institutional competences among federal and state entities (FGV 2011, p. 9).
Human resources	**Dedicated staffing** The scoping also highlighted a need for personnel dedicated to MRV activities. At present, the monitoring and reporting of emissions is often added on top of regular responsibilities (FGV 2011, p. 10). There is also high turnover of staff, particularly for the national inventory, since ministries often have no permanent teams (FGV 2011, p. 17).
	Improved technical capacity and staffing for corporate reporting Our scoping found that corporate reporting could benefit from additional training and support. This includes additional capacity within government agencies (particularly in states passing mandatory reporting legislation) in order to provide guidance and training to companies for corporate inventories.
Information and technology	**Country-specific emission factors** One survey respondent also expressed the desire for more nationally specific emission factors, which are needed due to Brazil's large variation in climate and geography (FGV 2011, p. 17).
	Localized emission factors database Interviewees also identified the need for, and difficulty of developing, a national emission factors database that could be applicable to several sectors and regions of the country (FGV 2011, p. 31).
	Improved methodologies for accounting for emissions from agricultural companies Interviews indicated that the only available methodologies for accounting for corporate emissions from the agriculture sector were those provided through the national inventory (FGV 2011, p. 32).This suggests a need for improved sector-specific methodologies for accounting for emissions from agricultural companies in Brazil. According to Brazil's 2010 inventory, the agriculture sector accounts for 19% of national emissions.
	Improved organization and sharing of data within an integrated information system and registry Scoping also revealed the need for an integrated information system and registry for reporting and collating greenhouse gas data. The need for a technical platform also extends to general data sharing online, where a platform could facilitate the exchange of information, knowledge, and technical and historical data (FGV 2011, p. 10).
	A central database for the forestry sector with accurate spatial information from all public and private forest ownership Technical capabilities for monitoring greenhouse gas emissions is especially high in the forestry and land use sector, where Brazil is a global leader in monitoring methodologies. However, respondents expressed a desire to develop a system integrating these data and information in an organized way (FGV 2011).

4.1.4 Conclusion

WRI's scoping activities with Brazilian partners found that while Brazil's capacity to monitor and track greenhouse gas emissions is relatively advanced, the country still faces challenges. This section highlights a few examples. A more detailed discussion of the specific challenges can be found in the full scoping report.

The Brazilian Government has taken concerted action to tackle the country's contribution to climate change. Efforts have focused on reducing deforestation, and in the past years the country has curbed these emissions, particularly in the Amazon region. At the same time, the contribution of the energy sector is increasing, and in 2020 the GHG emissions from energy are expected to equal those from deforestation in 2005 (FGV 2011 p. 35).

While the drive for climate policy has been led by the government—especially the Ministry of Foreign Affairs; the Ministry of Science, Technology, and Innovation; and the Ministry of the Environment—civil society and the corporate sustainability community have also become increasingly engaged in the debate, influencing decision making about climate mitigation policies and measures, particularly those related to deforestation and climate change policies.

In addition, some industries have taken steps to reduce their carbon footprint and to report on their emissions. This is mostly limited, however, to large multinational corporations or national companies that are global players. Through the Brazil Greenhouse Gas Protocol Program, WRI has worked with local partners such as FGVces to enhance this effort by building businesses' capacity to measure and report on their emissions. As more states require corporate reporting, coordination among them will be necessary to avoid creating duplication and excessive reporting burdens for companies.

4.2 COLOMBIA

JARED FINNEGAN

4.2.1 Executive summary

This section presents a summary of climate-related policies and institutions and select capacity needs related to greenhouse gas (GHG) measurement and performance-tracking systems in Colombia. It synthesizes the results of research assessments carried out by WRI's in-country partner, Andrés Mogollón Duffó, as part of the MAPT project.

4.2.2 Climate change-related policy and institutions in Colombia

Before presenting the results of scoping research in Colombia, it is important to first describe climate change-related policies and institutions in the country. The purpose of this section is not to provide a comprehensive list of all policies that aim to reduce GHG emissions in Colombia or to detail all Colombian institutions with climate-related responsibilities. Instead, it seeks to provide an overview of key climate change policies and institutions in the country in order to give the reader context for understanding the capacity needs highlighted in Section 4.2.3.

CLIMATE CHANGE-RELATED POLICIES

Colombia has submitted a variety of nationally appropriate mitigation actions (NAMAs) to the UNFCCC under the Copenhagen Accord (see Table 4.4) and embarked on a process to design and implement a low-carbon development strategy (LCDS).

Table 4.4 | **Colombia's nationally appropriate mitigation actions (NAMAs)[45]**

TYPE OF NAMA	DESCRIPTION OF NAMA	SECTOR
Unilateral	Ensure that at least 77% of the total energy capacity installed by 2020 is generated from renewable sources	Energy
Supported	Reduce deforestation in the Colombian Amazon rainforest to zero by 2020	Forestry
	Achieve 20% share of biofuels in national fuel consumption by 2020	Energy
	Increase the use of electric vehicles[46]	Transport
	Implement a national plan for freight transport[47] Promote transit-oriented development	Transport
Credited	Implement CDM in energy, forestry, industry, transport, and waste, with total emissions reduction potential of 54.8 $MtCO_2$ by 2020	Energy, forestry, industry, transport, and waste
	Take actions related to reducing emissions	Forestry

The development of Colombia's LCDS is led by the National Planning Department (DNP), the Ministry of Environment and Sustainable Development (MADS), and the Presidency. It aims to promote low-carbon economic growth in the transport, agriculture, industry, waste, and power sectors. The LCDS will guide the country in establishing emissions reduction goals and in assessing mitigation opportunities and costs. The aim is for the LCDS to be completed by 2014 and included in the 2014–18 National Development Plan, which will also include the National Strategy for Reducing Emissions from Deforestation (REDD +) and the National Plan for Adaptation to Climate Change.[48]

The Colombian Government recognizes that an effective GHG measurement and performance-tracking system will be critical to understanding the GHG effects of Colombia's NAMAs and to tracking performance of the LCDS. It has thus already taken steps to develop and implement a national MRV system and begin building MRV-related capacities in sectors targeted by the LCDS.

CLIMATE CHANGE–RELATED INSTITUTIONS

In July 2011, the Colombian Government published the "Institutional Strategy for the Articulation of Climate Change Policies and Actions in Colombia" (DNP 2011), which redefined the institutional arrangements related to climate change policy in the country and established the National Climate Change System (SNCC). Under the new arrangements, the DNP houses the Climate Change Mitigation Group, the principal institution for the development and coordination of climate change policy in the country. The Climate Change Mitigation Group was previously housed within MADS.

The DNP also chairs the Climate Change Executive Commission (COMECC), which is responsible for high-level coordination and orientation of the National Climate Change System. COMECC's members include ministers or vice ministers from a variety of ministries, including Agriculture, Mines and Energy, and Environment and Sustainable Development, among others.

The DNP is a cabinet-level department located directly under the Presidency and is in charge of coordinating all the social and economic national investment plans. It is also the secretariat of the National Social and Economic Policy Council (CONPES). It has the authority to coordinate all climate change–related ministries within the Colombian Government.

Colombia's national GHG inventories and national communications to the UNFCCC are the responsibility of the Colombian Institute for Hydrology, Meteorology, and Environmental Studies (IDEAM). In 2001, IDEAM published GHG inventories for the years 1990 and 1994 as part of Colombia's first national communication. In 2010, IDEAM published inventories for 2000 and 2004 as part of the second national communication. IDEAM is currently working on Colombia's third national communication, which will present GHG inventory data for the years 1990–2008.

4.2.3 Key measurement and performance-tracking capacity needs

The scoping report (Mogollón Duffó et al. 2011a) identified two overarching factors necessary to understand the Colombian context for GHG measurement and performance tracking. First, the practice of monitoring the GHG effects of climate change policies is still developing in the country. Second, policies that happen to mitigate GHG emissions were not originally intended for this purpose but to meet other development goals. Any mitigation that occurs as result of a policy is viewed as a cobenefit. As a result of these two factors, climate policy measurement and performance-tracking systems and institutional leadership for such activities are still under development in Colombia. Currently the national inventory is the primary monitoring tool being used to track Colombia's emissions, but Colombia is actively engaging in other MRV activities.

In addition to the two overarching factors mentioned above, the scoping reports identified a variety of areas where Colombia could benefit from strengthened capacities across a range of GHG measurement and performance-tracking activities, including national inventories, institutions, accounting for the GHG effects of mitigation actions and policies, and international reporting and performance tracking. While a full description of all the identified capacity needs can be found in the accompanying report, Table 4.5 outlines a selection of these, chosen because of their cross-cutting relevance to more than one GHG management activity. For example, the need for permanent and experienced staff is relevant across all GHG measurement and performance-tracking activities.[49]

4.2.4 Conclusion

Colombia is taking significant actions to reduce emissions while facilitating socioeconomic development, including the design and implementation of the Colombian Low Carbon Development Strategy. A robust GHG measurement and performance-tracking system will be critical in enabling the country to evaluate the effects of LCDS, improve outcomes, and report on progress. While Colombia has already taken numerous steps to design and implement such a system, a range of national GHG management capacities could be further strengthened, as outlined in Table 4.5.

Table 4.5 | **Select capacity needs in Colombia related to GHG measurement and performance tracking**[50]

CAPACITY CATEGORY	CAPACITY NEED
Human resources	**Permanent and experienced staff dedicated to measurement and performance-tracking activities** Our scoping found that Colombia could benefit from more professionals with training related to designing, implementing, and operating MRV-related systems (Mogollón Duffó et al. 2011a, p. 1). This includes the hiring and retention by public entities of permanent experienced staff members who are exclusively dedicated to carrying out MRV-related tasks (Mogollón Duffó et al. 2011b, pp. 1, 65–66). At the national level, IDEAM estimates that only 15 professionals have knowledge and expertise in Intergovernmental Panel on Climate Change (IPCC) accounting methodologies for national inventories (Mogollón Duffó et al. 2011b, p. 32). Furthermore, experience calculating the GHG impacts of mitigation policies and actions could be beneficial (Mogollón Duffó et al. 2011b, p. 67).
Institutions	**Legal framework, lead MRV institution, and clear institutional roles and responsibilities** The research revealed the need for a legal framework that ensures the implementation of an MRV system and designates a lead institution responsible for its operation (Mogollón Duffó et al. 2011a, p. 1). Furthermore, our scoping research found that Colombia could benefit from developing a mandate that clearly defines roles and responsibilities related to monitoring climate change policies (Mogollón Duffó et al. 2011b, p. 61). **Consistency of climate change–related goals across institutions** Many Colombian ministries have climate action plans. However, our scoping found that they could be enhanced with more consistency between each ministry's action plan and the goals of the DNP's national development plans in order to facilitate public-sector information sharing agreements (Mogollón Duffó et al. 2011b, p. 62), as well as agreement about MRV objectives.
Information and technology	**Online information platform** In order for information to flow between relevant users, the development, implementation, and operation of a systematized online platform is desirable, which can support the monitoring and evaluation of climate change policies (Mogollón Duffó et al. 2011a, p. 1).
Financial resources	**Financial resources to hire a permanent staff** Financial resources are needed in order to enable relevant public entities to hire a permanent staff of qualified professionals dedicated exclusively to undertaking MRV-related tasks, especially connected to mitigation (as opposed to adaptation) (Mogollón Duffó et al. 2011a, p. 1). **Allocation of national funds** Our scoping found that national funds need to be further allocated toward MRV-related tasks (Mogollón Duffó et al. 2011a, p. 1). Currently, the country relies on GEF funding to finance the development of the national inventory. However, these funds have been insufficient, and the national government has not allocated further national funding toward the development of the inventory (Mogollón Duffó et al. 2011b, p. 32).

4.3 ETHIOPIA

SAMAH ELSAYED

4.3.1 Executive summary

This section presents a summary of climate-related policies and institutions and select capacity needs related to greenhouse gas (GHG) measurement and performance-tracking systems in Ethiopia. It synthesizes the results of research assessments carried out by WRI's in-country partner, Echnoserve.

4.3.2 Ethiopia's MRV landscape: Key policies and institutions

Ethiopia has demonstrated a strong commitment to promoting low-carbon development and has pledged to become a carbon-neutral middle-income country by 2025. This has been made a national priority through the country's Climate-Resilient Green Economy (CRGE) strategy which outlines ambitious plans for reducing emissions in seven key sectors (Federal Democratic Republic of Ethiopia 2011). As Ethiopia moves toward the implementation of these plans, having in place the measurement and tracking systems required to monitor greenhouse gas emissions and ensure that Ethiopia is meeting these domestic targets is emerging as an important priority.

The CRGE plan integrates economic development with adaptation and mitigation priorities. The CRGE strategy formed an integral part of Ethiopia's 5-year Growth and Transformation Plan (GTP) which aims to ensure sustainable development of the country. The CRGE initiative, takes place under the leadership of the Prime Minister's Office, the Environmental Protection Authority (EPA) (now Ministry of Environment and Forests (MoEF)), and the Ethiopian Development Research Institute. The Ethiopian Development Research Institute is a semiautonomous think tank focused on economic research and policy analysis. Since February 2011 these organizations have been working together to develop a strategy to build a green economy. Seven sectoral teams, all together drawing on over 50 experts from more than 20 leading government institutions have been driving the initiative. The objective is to identify green economy opportunities that could help Ethiopia reach its ambitious growth targets while keeping greenhouse gas emissions low. The government intends to attract development partners to help implement this new sustainable growth model.

The CRGE strategy has two main components: Adaptation to Climate Change and Mitigation of Greenhouse Gases. The Green Growth Plan (GGP) is essentially the mitigation component of the CRGE and is divided into seven thematic areas. The technical committee coordinates preparation of the GGP and creates synergies among stakeholders.

Ethiopia has shortlisted more than 60 green economy opportunities as part of the CRGE, potentially reducing emissions by 64% from business as usual (based on growth projections) (Federal Democratic Republic of Ethiopia 2011).

4.3.3 Capacity challenges

As part of its scoping research, WRI has carried out a series of activities, including desk research, a scoping trip, an in-country consultation workshop on the CRGE, a survey of key stakeholders, and one-on-one interviews in order to understand the key domestic gaps in capacity and develop a work plan to address these needs.

The scoping exercise identified a number of areas in which Ethiopian authorities could focus their efforts to further improve the country's institutional, human resource, and technical capacities in order to more effectively monitor and report on greenhouse gas emissions. In particular, Ethiopia could benefit from clearer institutional mandates and arrangements, greater numbers of trained staff across the key ministries and sectors, technical knowledge and systems, and dedicated financial resources (Fikreyesus et al. 2011, pp. 6, 29).

For example, the scoping found that clear guidelines or mandates assigning responsibility for the collection and dissemination of greenhouse gas emissions data at a national, subnational, and sectoral level would be valuable (Fikreyesus et al. 2011, pp. 6, 29). It is important that the country have a legal framework or mandate to direct agencies and industries to monitor and report their greenhouse gas emissions, and an institution will need to be designated as the lead for collecting this data (Fikreyesus et al. 2011, p. 6). It is likely that these responsibilities will now fall to the Environmental Protection Authority (now MoEF), as it has recently taken over all international mandates, including the national inventory and national communication process from the National Meteorological Agency. At the time of research, EPA had no official mandate to collect this data, however, outside of the national communication process, and no agreements are in place with other agencies.

The transfer of responsibility to the EPA for the production of the national communication also highlights another key capacity concern. Technical capacity within the EPA will need to be built in order to conduct a national inventory. EPA staff members have emphasized the need for additional training to effectively conduct this mandate; however, they also note that in general the few trainings and workshops that have been conducted have been undermined by their one-off nature and lack of long-term follow-up and support (Fikreyesus et al. 2011, p. 7). Broadly, beyond the EPA, there is a need for additional personnel with skills in areas such as monitoring GHG emissions, data collection, data verification, and analysis. In addition to the institutional and human resource challenges, there are a series of technical issues, including technological resource needs and methodological constraints. For example, survey respondents identified a need for tools and methodologies applicable to the local context. In addition, there is currently no platform for effectively storing and reporting data (Fikreyesus et al. 2011, p. 7). This lack of technological infrastructure presents a major challenge to sharing data and information among institutions.

In summary, our scoping found that Ethiopia's GHG measurement and tracking system faces the challenges described in Table 4.6.

4.3.4 Conclusion

Since the scoping research was conducted in 2011, Ethiopia has moved quickly to further define and implement the plans associated with the CRGE. The EPA (now MoEF) and other key stakeholders are now thinking through the necessary processes and institutions required for the monitoring of emissions associated with these national plans. In addition, Ethiopia is embarking on its next national inventory, highlighting the need to ensure that the systems in place for tracking GHG emissions for the inventory complement those needed for the CRGE. WRI is working closely with the MoEF to identify priorities and support capacity-building efforts.

Table 4.6 | **Select capacity needs in Ethiopia related to GHG measurement and performance tracking**

CATEGORY	CAPACITY NEED
Institutional	**A clear institutional mandate detailing responsibility for collecting and disseminating GHG emissions data at all levels** The scoping found that Ethiopia could benefit from a clear institutional mandate for greenhouse gas monitoring activities. While the Environmental Protection Authority acts as the focal institution for international conventions (including the Kyoto Protocol and UNFCCC), and Proclamation No. 295/2002 of the Environmental Protection Organs Establishment also declares the EPA to be the coordinating institution for environmental issues federally and sectorally, at the time of research, the EPA (now Ministry of Environment and Forests) had no explicit mandate to lead climate activities (Fikreyesus et al. 2011, p. 29) and no single agency is responsible for tracking greenhouse gas emissions data (Fikreyesus et al. 2011, p. 6). As a result, no agency currently has the official authority to direct entities to monitor and report on their greenhouse gas emissions (Fikreyesus et al. 2011, p. 6). **A clear mandate directing agencies and sectors to report on their emissions** In addition to the value of a mandate for a lead agency, the scoping also indicated that government agencies, as well as sectoral entities and industry do not have a mandate directing them to collect data or monitor GHG emissions within their respective sectors. This lack of a mandate makes it impossible to allocate government resources, including personnel and financial ones, to these agencies (Fikreyesus et al. 2011, p. 6).
Human resources	**Trained personnel and dedicated staff** A central concern mentioned throughout the scoping was the need for technical staff familiar with MRV. Specifically, respondents indicated that Ethiopia needs trained personnel in areas such as the monitoring of GHG emissions, data collection, and data verification. Key institutions do not have dedicated staff working in these areas (Fikreyesus et al. 2011, pp. 7–8). **Adequate training and capacity-building programs** Scoping respondents also raised the need for long-term capacity-building activities rather than short-term training. The few training workshops that have taken place, they said, were either not sufficiently in-depth or lacked follow-up and practical application (Fikreyesus et al. 2011, p. 7).
Information and technology	**Locally applicable data collection tools and methodologies** Respondents identified a need for improved technical capacity, particularly in terms of tools, guidelines, and methodologies that have been adapted to Ethiopia's country-specific context and circumstances (Fikreyesus et al. 2011, p. 7). **Technical infrastructure to collect, store, and share data** At present no platform or mechanism exists for national, subnational, and government agencies to collect, store, and share data (Fikreyesus et al. 2011, pp. 7, 32, 33).
Financial	**Adequate financial resources** Respondents emphasized financial constraints as a challenge that prevents the creation and maintenance of a data collection and monitoring system. This is further exacerbated by the lack of a mandate for monitoring GHG emissions, which results in no budget being allocated to GHG monitoring activities (Fikreyesus et al. 2011, p. 7).

4.4 INDIA

JARED FINNEGAN

4.4.1 Executive summary

This section presents a brief summary of climate-related policies and institutions and select capacity needs related to greenhouse gas (GHG) measurement and performance-tracking systems in India. It synthesizes the results of research assessments carried out by WRI's in-country partner, ABPS Infrastructure Advisory Private Limited, under the MAPT project.

4.4.2 Climate change-related policies and institutions in India

This section describes key climate change-related policies and institutions in India. It is not meant to provide a comprehensive list of all policies that aim to reduce GHG emissions in India or of all Indian institutions with climate-related responsibilities. Instead, this section seeks to provide an overview of several key climate change policies and institutions in the country in order to give the reader context for understanding the capacity needs highlighted in Section 4.4.3.

CLIMATE-RELATED POLICIES

Internationally, India has submitted a pledge to the United Nations Framework on Climate Change (UNFCCC) to reduce the emissions intensity of its GDP by 20–25% by 2020 in comparison to the 2005 level (excluding the agricultural sector) (UNFCCC 2011a), which will be incorporated into the country's 12th 5-year plan (for 2012–17) (see Planning Commission 2011a). Domestically, the country released the National Action Plan on Climate Change (NAPCC) in June 2008 (see Table 4.7). The plan includes eight missions, two of which are related to mitigation—the National Solar Mission (NSM), which aims for 20 GW of installed solar capacity generation by 2022, and the National Mission for Enhanced Energy Efficiency (NMEEE), which aims for 10 GW of energy efficiency savings by 2020.

The NMEEE includes the Performance, Achieve, and Trade (PAT) mechanism, a market-based scheme, launched in 2012, to improve energy efficiency in energy-intensive large industries. The scheme is expected to result in 26.21 metric tons of GHG savings in the first years of implementation (NMEEE 2012). The NMEEE also includes the Market Transformation for Energy Efficiency (MTFEE), Energy Efficiency Financing Platform (EEFP), and Framework for Energy Efficient Economic Development (FEEED) programs.[51] The other six missions of the NAPCC relate to adaptation and information.

In line with the NAPCC and coordinated and supported by the national Ministry of Environment and Forests (MoEF), Indian states are in the process of developing state action plans on climate change (SAPCCs). The purpose of the state-level plans is to ensure that the objectives of the NAPCC are achieved and that the national plan is implemented effectively at the state level. As of September 2013, the action plans of nine states have been endorsed by the National Steering Committee on Climate Change; the plans of three states are under consideration by the Expert Committee on Climate Change (MoEF 2013).

India has also introduced a "coal tax" by charging 50 rupees per metric ton on domestic and imported coal. Revenue generated from the tax is being used to support the development of a National Clean Energy Fund, which will fund research and innovative projects in clean energy technology.

Table 4.7 | **India's National Action Plan on Climate Change (NAPCC)[52]**

FOCUS	MISSION	OBJECTIVE	RESPONSIBLE INSTITUTION
Mitigation	National Solar Mission (NSM)2020	20,000 MW of solar power by 2022	Ministry of New and Renewable Energy
	National Mission for Enhanced Energy Efficiency (NMEEE)	10,000 MW of energy efficiency savings by 2020	Ministry of Power, Bureau of Energy Efficiency (BEE)
Adaptation	National Mission for Sustainable Habitat (NMSH)reduction potential of 54.8 $MtCO_2$ by 2020	Energy efficiency in residential and commercial buildings, public transport; solid waste management	Ministry of Urban Development
	National Water Mission (NWM) National Mission for Sustaining the Himalayan Ecosystem (NMSHE)	Water conservation, river basin management	Ministry of Water Resources
	National Mission for Sustaining the Himalayan Ecosystem (NMSHE)	Conservation and adaptation practices, glacial monitoring	Ministry of Science and Technology
	National Mission for Sustainable Agriculture (NMSA)	Drought proofing, risk management, agricultural research	Ministry of Agriculture
	Green India Mission (GIM)	6 million hectares of afforestation over degraded forest lands by the end of the 12th 5-year plan	Ministry of Environment and Forests
Information	National Mission on Strategic Knowledge for Climate Change (NMSKCC)	Vulnerability assessment, research and observation, data management	Ministry of Science and Technology

CLIMATE-CHANGE RELATED INSTITUTIONS

The nodal institution responsible for both national and international climate change-related issues in India is the Ministry of Environment and Forests. The MoEF plans, promotes, coordinates, and oversees the implementation of all environmental and forestry programs and policies in the country. The Climate Change Division within the MoEF is India's primary agency for coordinating the NAPCC, SAPCC, and UNFCCC processes.

India's commitment to reduce the emissions intensity of its GDP has led to the formation of the Expert Group on Low-Carbon Strategies for Inclusive Growth (by the Planning Commission),[53] which was mandated to chart a road map to achieve this goal. The group is comprised of a range of stakeholders, including representatives from industry, think tanks, research institutions, civil society, and government. The group released an interim report in 2011 that recommended prioritized actions in a variety of sectors.[54] The key findings became part of India's 12th 5-year plan, which took effect in 2012.

The Indian Network for Climate Change Assessment (INCCA) was launched in October 2009 by the MoEF to develop methods for monitoring and estimating GHG emissions as well as forecasting and modeling climate change impact scenarios in a transparent and reliable way. The network is comprised of 228 scientists and 127 institutions across the country.

The Bureau of Energy Efficiency (BEE), created in 2002 by the Energy Conservation Act and housed within the Ministry of Power, designs and develops policy guidance for energy efficiency and energy conservation policies in the country. It is responsible for coordinating the implementation and monitoring of the NMEEE, including the Perform, Achieve, and Trade (PAT) scheme.

4.4.3 Key GHG measurement and performance-tracking capacity needs

Overall, India has significant technical expertise and, in some areas, well-established capacity to carry out measurement and performance tracking activities. For example, the country has released a national inventory for 2007, making it the first developing country to publish emissions data for that year. The inventory was a significant improvement over the first national communication to the UNFCCC published 2004, as it includes broader coverage of GHGs and emissions sources, more Tier III measurements, and increased use of country-specific emission factors (ABPS 2011, p. 91). Moreover, the country has well-established data collection systems in place, which could serve as starting points for monitoring the performance of the NAPCC (ABPS 2011, p. 91). Lastly, the PAT scheme has developed a robust, reliable, and transparent monitoring and verification mechanism and institutional arrangement that could be used as a model for India's NAMAs, if or when relevant (ABPS 2011, p. 94).

The scoping research in India identified specific areas where India could benefit from further capacity strengthening across a range of GHG measurement and performance-tracking activities, including data collection and information systems for tracking climate change, accounting for the GHG effects of mitigation policies and actions, performance tracking of national actions, and carbon market design.[55]

While a full description of all the identified capacity needs can be found in the accompanying report, Table 4.8 outlines a selection of these needs.[56] The capacity needs highlighted in the table were selected based on their relevance across a range of GHG measurement and performance-tracking activities.

Table 4.8 | **Select capacity needs in India related to GHG measurement and performance tracking**[57]

CAPACITY CATEGORY	CAPACITY NEED
Institutions	**A dedicated and institutionalized inventory management authority and information system** India could benefit from further institutionalization of an inventory management system, such as a National GHG Inventory Management Authority, that is able to systematically develop time series data for previous gaps in data, track emissions and the effectiveness of national policies over time, and be continuously reviewed (ABPS 2011, pp. 33, 91).[58] **Streamlined institutional structures and coordination mechanisms for data collection** India currently has institutions with mechanisms for collecting relevant climate change data. While these can serve as a starting point for tracking the performance of the NAPPC or climate-related policies, enhancing the frequency of data updates and creating a consistent format for streamlined access could be beneficial (ABPS 2011, p. 91). Similarly, an institutional structure for collecting GHG emissions data from various sectors would be valuable, beyond the one being used for the national communication process (i.e., the national communication cell of the MoEF) (ABPS 2011, p. 15). **Institutional framework to provide technical support to micro-, small, and medium-sized enterprises** The corporate sector will be integral to implementation of the National Mission for Enhanced Energy Efficiency (NMEEE), one of the primary mitigation strategies under the National Action Plan on Climate Change (NAPCC). For micro-, small, and medium-sized enterprises in particular, a strengthened institutional framework could be beneficial, providing technical support necessary for implementing the NMEEE (ABPS 2011, p. 43).
Information and technology	**Data quality** There is a need for robust quality assurance and quality control procedures performed on a regular basis; commissioning of surveys to ascertain data gaps; analysis to understand data uncertainty, and regular; independent, third-party reviews of the national inventory (ABPS 2011, p. 92).[59] **Methodologies and guidance for quantifying GHG impacts of policies** Methodologies and guidance are needed to quantify the impact of India's climate-related policies. Furthermore, understanding emissions impacts of policies will be beneficial for reporting under the UNFCCC through national communications and biennial update reports (ABPS 2011, p. 50). **Mechanism to estimate GHG emissions** The scoping found that India could benefit from a systematic approach for estimating previous gaps in emissions information and for projecting emissions in the future. To this end, a robust mechanism to estimate GHG emissions on a regular basis could be established, especially to support performance tracking toward India's emissions intensity goal in particular (ABPS 2011, p. 33).[60]

4.4.4 Conclusion

India is taking action to reduce emissions while facilitating socioeconomic development through a variety of efforts, including a national GHG mitigation goal and renewable energy and energy efficiency targets. A robust GHG measurement and performance-tracking system will be critical in enabling the country to evaluate the effects of these efforts, improve outcomes, and report on progress. While India already has significant human resource and technical expertise and, in many areas, well-established capacity to design and implement systems for GHG measurement and performance tracking, our research suggests that further capacity-building efforts could be valuable in several areas, particularly institutions and information and technology.

4.5 SOUTH AFRICA

SAMAH ELSAYED

4.5.1 Executive summary

This section presents a summary of climate-related policies and institutions and select capacity needs related to greenhouse gas (GHG) measurement and performance-tracking systems in South Africa. It synthesizes the results of research assessments carried out by WRI's in-country partner, the Energy Research Centre (ERC) at the University of Cape Town.

4.5.2 South Africa's GHG measurement and tracking landscape: Key policies and institutions

Measurement and tracking of domestic greenhouse gas emissions is emerging as a key concern in South Africa given the country's growing commitment to coupling low-carbon growth with economic development priorities.

South Africa's status as a major emerging world economy and its rapid levels of industrial growth heighten the importance of having in place systems to effectively measure and track the emission of greenhouse gases over the coming years. In terms of absolute CO_2 emissions, South Africa ranked 20th in the world in 2007, with the vast majority of CO_2 emissions (about 80%) generated by the electricity sector, the metals industry, and the transport sector (WRI 2012).

In October 2011, the South African cabinet approved the National Climate Change Response white paper (South Africa 2011). This is South Africa's first national policy focusing specifically on climate change and covers mitigation, adaptation, institutional arrangements, and monitoring and evaluation. The 6-year process that culminated in the white paper included a series of research activities, national conferences, workshops, stakeholder engagement, a review by the National Economic Development and Labour Council (NEDLAC), and parliamentary hearings.

This policy has two objectives:

- "To effectively manage the inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity; and
- "To make a fair contribution to the global effort to stabilize greenhouse gas (GHG) concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner" (South Africa 2011).

The mitigation target is that of a "peak, plateau, and decline" trajectory. Emissions are projected to peak in 2025 to an upper limit of 614 $MtCO_2e$, plateau until 2035 and then decline.

The outline below gives other highlights of the white paper:

- A carbon budget approach
- Emissions reduction outcomes for key sectors and subsectors of the economy
  - Companies and subsectors with reduction outcomes required to prepare and submit mitigation plans
- Move from voluntary to mandatory mitigation reporting
  - Mandatory reporting of emissions data for entities that emit more than 0.1Mt of GHGs annually, or that consume more than 0.1 Mt of emissions from the electricity sector

- Near-Term Priority Flagship programs (including):
  - Renewable Energy Flagship Programme
  - Energy Efficiency and Energy Demand Management Flagship Programme
  - Transport Flagship Programme
  - Carbon Capture and Sequestration Flagship Programme
  - Adaptation Research Flagship Programme
- Sector Job Resilience plans
- Mainstreaming
- Climate Change Response Monitoring and Evaluation System

The white paper identifies tracking of greenhouse gas emissions as a priority, with a section focusing on the need to establish the Climate Change Response Monitoring and Evaluation System, which would evolve with international requirements for MRV (ERC 2011, p. 26). This system is due to be developed within 2 years of the white paper's publication (i.e., by late 2013).

As noted in the outline above, a key outcome of the white paper is a move from voluntary to mandatory reporting of emissions data for major emitters (emitting more than 0.1Mt of GHGs annually or that consume more than 0.1 Mt of emissions from the electricity sector). These entities will also be required to report on energy use by energy carrier and other data.

The National Treasury announced a carbon tax in February 2013, another national policy necessitating an effective system for measurement, reporting, and verification of GHG emissions (ERC 2011, p. 26). The government proposed introducing the tax in January 2015 at R120 per ton (t) CO_2-eq above the tax-free thresholds, including the proposed offsets. In addition, South Africa has also set a voluntary national target for improving energy efficiency by 12% by 2015 through its Energy Efficiency Strategy.

Other key national policies and legislation include the National Energy Act of 2008. This has a draft regulation on the provision of energy data, which could be applied to support MRV-related activities. The National Energy Act also includes Regulations on the Allowance for Energy Efficiency Savings. These outline the methodology and process for issuing energy saving certificates, which may have implications for building human resource capacity for monitoring and verification.

The white paper also assigns responsibility for integrating climate change activities across government departments to the Department of Performance Monitoring and Evaluation in the Presidency (ERC 2011, p. 7). In addition, South Africa already has an elaborate institutional framework and system, which can be expanded for the monitoring of GHG emissions and climate policies. This includes various institutions, actors, policies, and initiatives as illustrated in Figure 4.1.

Figure 4.1 | **Mapping of existing initiatives, databases, actors, and regulations**

INSTITUTIONS	ACTORS	POLICIES, GUIDELINES, STANDARDS	INITIATIVES RELATING TO MRV
■ Department of Environmental Affairs ■ Department of Energy ■ Department of Trade & Industry ■ Dept of Transport ■ Statistics South Africa ■ SANEDI	■ Government representatives ■ M&V teams ■ Municipalities ■ Industry (Eskom & SASOL) ■ Civil society	■ National Climate Change Response Paper ■ Draft Energy Efficiency Tax regulation ■ Draft Provision of Energy Regulations ■ IPMVP ■ SANAS/SABS ■ SANS:50001 ■ AQA - Draft GHG Reporting	■ Government representatives ■ M&V teams ■ Municipalities ■ Industry (Eskom & SASOL) ■ Civil society

Source: ERC 2011, p. 18.

The **Department of Environmental Affairs (DEA)** is the government institution responsible for climate change-related activities in South Africa. In addition to this domestic responsibility, the DEA is the key institution involved in international conventions and negotiations, including the submission of South Africa's greenhouse gas inventory to the UNFCCC. While the DEA maintains the Environmental Statistical System and the South African Air Quality Information System (SAAQIS), it does not have an official mandate to collect energy data (ERC 2011, p. 19).

The **Department of Energy (DoE)** is mandated to collect emissions data from the energy sector, which is responsible for the largest proportion of greenhouse gas emissions in South Africa. The DoE also provides data on energy use and supply. Although it is developing a Central Energy Database, at the time of the scoping this was not publicly accessible and little information was available on the database's content (ERC 2011, p. 19).

Eskom, a public enterprise, is the main provider of electricity in South Africa, with coal-fired plants contributing a third of the country's emissions. Eskom has access to company-level data that is not accessible publicly. Eskom reports to the Department of Public Enterprises rather than to the DoE, which has no official mandate over Eskom or access to Eskom's data (ERC 2011, p. 19).

Other key government departments include the **Department of Trade and Industry (DTI)** and the **Department of Transport (DoT),** which are increasingly engaging in energy-related initiatives. At present, however, there is no process for capturing energy data from these departments by DEA (ERC 2011, p. 19). **Statistics South Africa (Stats SA)** is the government agency responsible for quality assurance of national data and promoting coordination among statistical producers in South Africa. Stats SA does not directly collect data, however, unless it has a specific mandate to do so (ERC 2011, p. 20). The **National Statistics System Division (NSSD)** coordinates the institutional arrangements between Stats SA and the relevant line ministries and also plays a significant role in certification and the development of standards (ERC 2011, p. 20).

4.5.3 Capacity needs

While overall capacity in South Africa is relatively high compared to many non-Annex 1 countries, the DEA is currently working to increase this capacity further in order to implement the white paper.

The mapping exercise conducted by the ERC shows that there already exists a "range of actors, activities, databases and regulations [...], which can provide a strong basis for a domestic MRV system" (ERC 2011, p. 17). However, greater coordination and linkages between preexisting systems could lead to a more coherent framework (ERC 2011, p. 17). The involvement of many institutions in the collection of emissions-related data provides both a good foundation for the Monitoring and Evaluation System and a challenge to be met in building coherence and lessening duplication of effort (ERC 2011, p. 18). Given that the system is still under development, no centralized authority is currently responsible for collecting data (ERC 2011, p. 18).

Table 4.9 presents the recommendations of our scoping partner, the ERC, for overcoming the identified capacity gaps related to monitoring and evaluation.

Key recommendations made by WRI's in-country partners at the Energy Research Centre (ERC) include the following:

- Coordinate MRV efforts under government guidance.
- Create a cross-governmental steering committee to ensure ownership of the process by other departments.
- Create small project steering group within the DEA to coordinate donor efforts in MRV to avoid duplication.
- Coordinate to ensure cost-effectiveness and keep the additional cost for reporting to a minimum. Costly compulsory MRV requirements may affect the business environment and competitiveness.
- Build on existing structures. Engage government agencies and research institutions according to their expertise in data collection and management.
- Develop guidelines and standards for data collection and management and build capacity accordingly. This facilitates transfer and data sharing between institutions.

Table 4.9 | **Select capacity needs in South Africa related to GHG measurement and performance tracking**

CATEGORY	CAPACITY NEED
Institutional	**Avoid reporting fatigue by building on existing structures** (ERC 2011, p. 23) At present various reporting requirements and structures exist for a number of South Africa's departments and public actors. In order to minimize additional stresses, the new MRV system will need to take these standards and reporting cycles into account. **A cross-governmental steering committee** (ERC 2011, p. 24) Currently DEA has no direct mandate or influence over Eskom or other key public enterprises and industrial development policies. South Africa would benefit from a cross-departmental steering committee that brings together actors such as the Presidency, Treasury, DTI, DPE, and DoE to foster ownership across institutions. **Greater coordination and expanded mandates for energy data collection** (ERC 2011, p. 19) The energy sector is the main contributor of emissions in South Africa. Yet while the DEA is responsible for maintaining the Environmental Statistical System and the South African Air Quality Information System (SAAQIS), it has no formal mandate for energy sector data collection, which is the responsibility of the DoE. There is no mandate or transparent process for DoE to collect data from Eskom, which reports to the Department of Public Enterprises, or other departments such as the Department of Trade and Industry (DTI) and the Department of Transport (both increasingly engaged in energy-related activities). **Formalized coordination and centralization of efforts** (ERC 2011, p. 18) The scoping exercise found that a range of both public and private actors are involved in collecting emissions-related data; the system could be strengthened, however, by greater coordination to prevent duplication of effort. **Learn from experience of Stats SA** (ERC 2011, p. 20) The scoping report also suggests that South Africa would benefit from a process to formalize agreements with all line ministries that collect relevant data. Stats SA has experience developing memorandums of understanding with individual government departments, a valuable example of linking and coordinating information and data systems that can be applied in designing a domestic MRV system.
Human resources	**Increase in the numbers of SANAS-accredited M&V professionals** (ERC 2011, p. 44) New regulations such as the Energy Efficiency Tax will increase the demand for professionals with monitoring and verification skills who have been accredited by the South African National Accreditation System (SANAS).

CATEGORY	CAPACITY NEED
Information and technology	**Improved coordination and accessibility across databases** (ERC 2011, p. 28) South Africa currently has four major databases that house emissions data, as well as various sectoral or program-level databases. This includes: a. the Greenhouse Gas Inventory; b. the South African Air Quality Information System (SAAQIS); c. the Open Energy Database (OPENED) project; and d. DoE's central energy database. South Africa could benefit from improved coordination and accessibility across these databases. **Standardized guidelines for verification in industry sector** (ERC 2011, p. 22) While industry measurement and reporting takes place in-house at a company level for major emitters, verification falls to external consultants. Formal coordination of verification efforts or standardization of guidelines could be valuable. **Support and capacity building for moving from a voluntary to a mandatory corporate reporting system** As outlined in the white paper, South Africa is moving toward mandatory reporting for all major emitters. For this to succeed additional technical capacity will need to be built at a corporate and a facility level.
Financial	**Increased funding for data collection in the AFOLU sector** (ERC 2011, p. 40) The scoping activities included a case study looking at MRV in the agriculture, forestry, and land use sector. One of the findings was that capacity needs to be built for data collection activities and that the sector could benefit from additional investment in this area.

- Fund training and capacity building
  - in data collection and management in governmental agencies and departments;
  - for SANAS accredited M&V personnel;
  - for master-level experts on GHG and emissions management; and
  - for master-level statisticians.
- Avoid duplication and reporting fatigue caused by multiple reporting cycles and requirements.
- Do more research on institutional arrangements and benefits of compulsory versus voluntary reporting.
- Do more research on institutional arrangements and benefits of a centralized external verifier with "policing" function versus a decentralized, participative, self-certifying system.
- Create long-term incentives for reporting. The MRV system requires clear incentives and regulations for reporting. These should be carefully thought through; when rules are changed easily, this can undermine the credibility of a framework.
- Frame the nationally appropriate mitigation actions (NAMAs) to ensure that sustainable development is key.
- Ensure that MRV focuses on reporting the "cobenefits" of mitigation action. (ERC 2011, pp. 45–52)

4.5.4 Conclusion

South Africa has demonstrated a commitment to enhancing its capacity to monitor and track greenhouse gas emissions at the national level. The Department of Environmental Affairs is setting up technical groups to explore options for further institutionalizing its measurement and evaluation system as mandated in the National Climate Change Response white paper. While the capacity needs identified in this section are by no means exhaustive, they do identify some of the areas that can be taken into consideration as this system is developed and implemented.

4.6 THAILAND

JARED FINNEGAN

4.6.1 Executive summary

This section presents a brief summary of climate-related policies and institutions and select capacity needs related to greenhouse gas (GHG) measurement and performance-tracking systems in Thailand. It synthesizes the results of research assessments carried out by WRI's in-country partner, the Thailand Greenhouse Gas Management Organization (TGO), as part of the MAPT project.

4.6.2 Climate change-related policies and institutions in Thailand

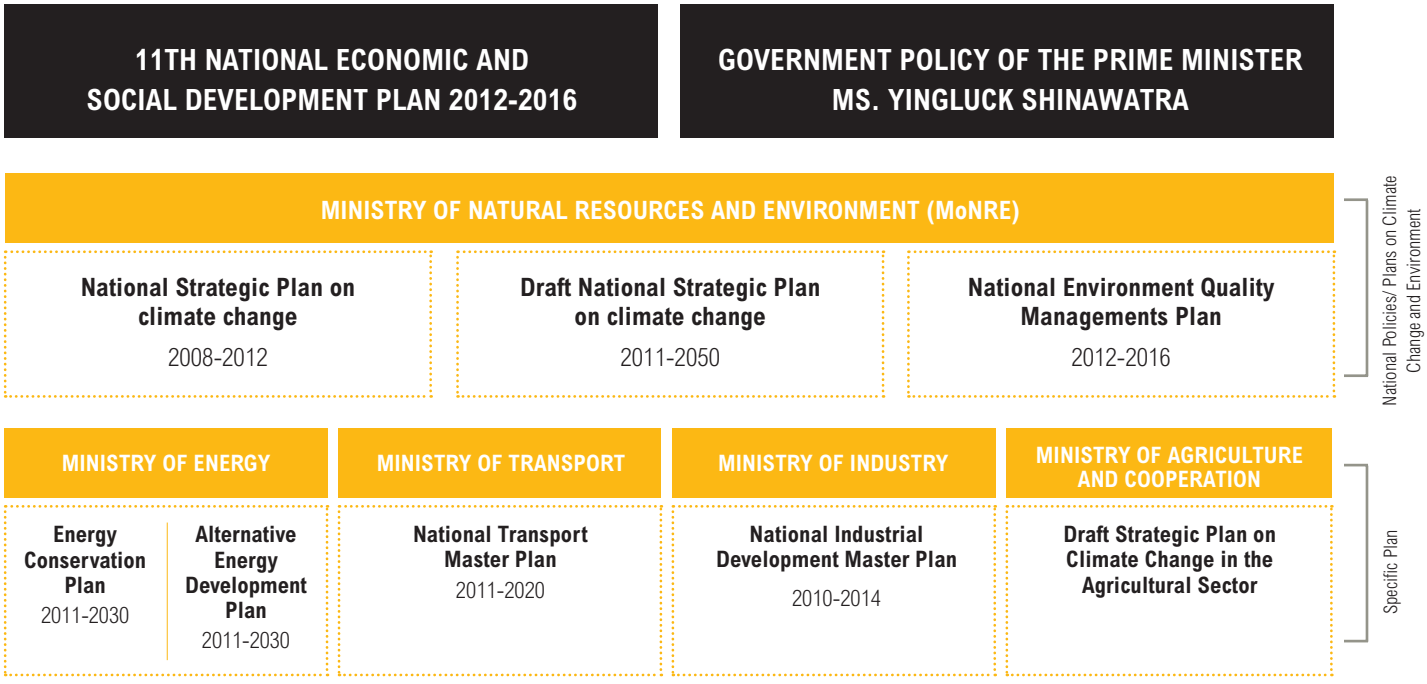
As background for the results of WRI's research in Thailand, this section first describes climate change-related policies and institutions in the country. The purpose of this section is not to provide a comprehensive list of all policies that aim to reduce GHG emissions in Thailand or of all Thai institutions with climate-related responsibilities. Instead, it seeks to provide an overview of key climate change-related policies and institutions in order to give the reader context for understanding the capacity needs highlighted in Section 4.6.3.

CLIMATE CHANGE-RELATED POLICY

Although Thailand has yet to either officially associate with the Copenhagen Accord or submit a nationally appropriate mitigation action (NAMA) to the United Nations Framework Convention on Climate Change (UNFCCC), the country has submitted a letter to the UNFCCC communicating that it is in the process of considering such an association. The scoping research in Thailand found that a lack of information related to mitigation potential and impacts of mitigation measures has kept Thailand from submitting a national target (TGO 2012, p. 12). Nevertheless, Thailand has developed a variety of national plans aimed at reducing emissions and adapting to climate change.

National climate change policymaking in Thailand is embedded within the overarching National Economic and Social Development Planning process, the policies of the prime minister, and the National Strategic Plans on Climate Change (see Figure 4.2).

Figure 4.2 | **Climate change-related policy structure in Thailand**



Source: TGO 2012, p. 5

National economic and social development plans are published every 4 years and represent Thailand's overall development master plan. The 11th National Economic and Social Development Plan (2012-2016) includes strategies aimed at promoting sustainable development through the development of renewable and bioenergy and a reduction in industrial-sector carbon intensity.

The prime minister, Ms. Yingluck Shinawatra, has introduced a range of measures aimed at reducing emissions. They include increasing the use of renewable energy in the industrial sector by encouraging producers to earn extra income from selling carbon credits, using taxes and incentives to encourage industries to conserve energy, and displacing 25% of energy generated from fossil fuels with renewable and alternative sources within the next decade.

The objective of the National Strategic Plan on Climate Change (2008-2012) is to prepare Thailand to cope with and adapt to the impacts of climate change. It includes six strategies, one of which is to promote GHG mitigation through the adoption of clean technologies in energy and manufacturing industries. Other strategies include building adaptation capacity, researching climate change impacts, and supporting international cooperation to reach the common goal of climate change mitigation and sustainable development.

The Draft National Master Plan on Climate Change (2012-2050) is much larger in temporal scope and is comprised of three implementation phases. Its overall aim is to reduce Thailand's GHG emissions and guide the country to becoming a low-carbon society by 2050.

At the sectoral level, a number of climate change-related development plans exist. Examples include:

- the National Alternative Energy Development Plan (2012-2021), which aims to increase the share of alternative energy to 25% of total energy consumption by 2021 by replacing oil imports with renewable energy generation and encouraging renewable energy technologies;
- the Energy Conservation Plan (2011-2030), which aims to reduce energy intensity in Thailand by 25% in 2030, resulting in an estimated total cumulative energy savings of 289,300 kilotons of oil equivalent (ktoe), or 976 million tons of avoided CO_2e emissions from 2011 to 2030; and
- the National Transport Master Plan (2011-2020), which promotes the use of clean energy transport modes.

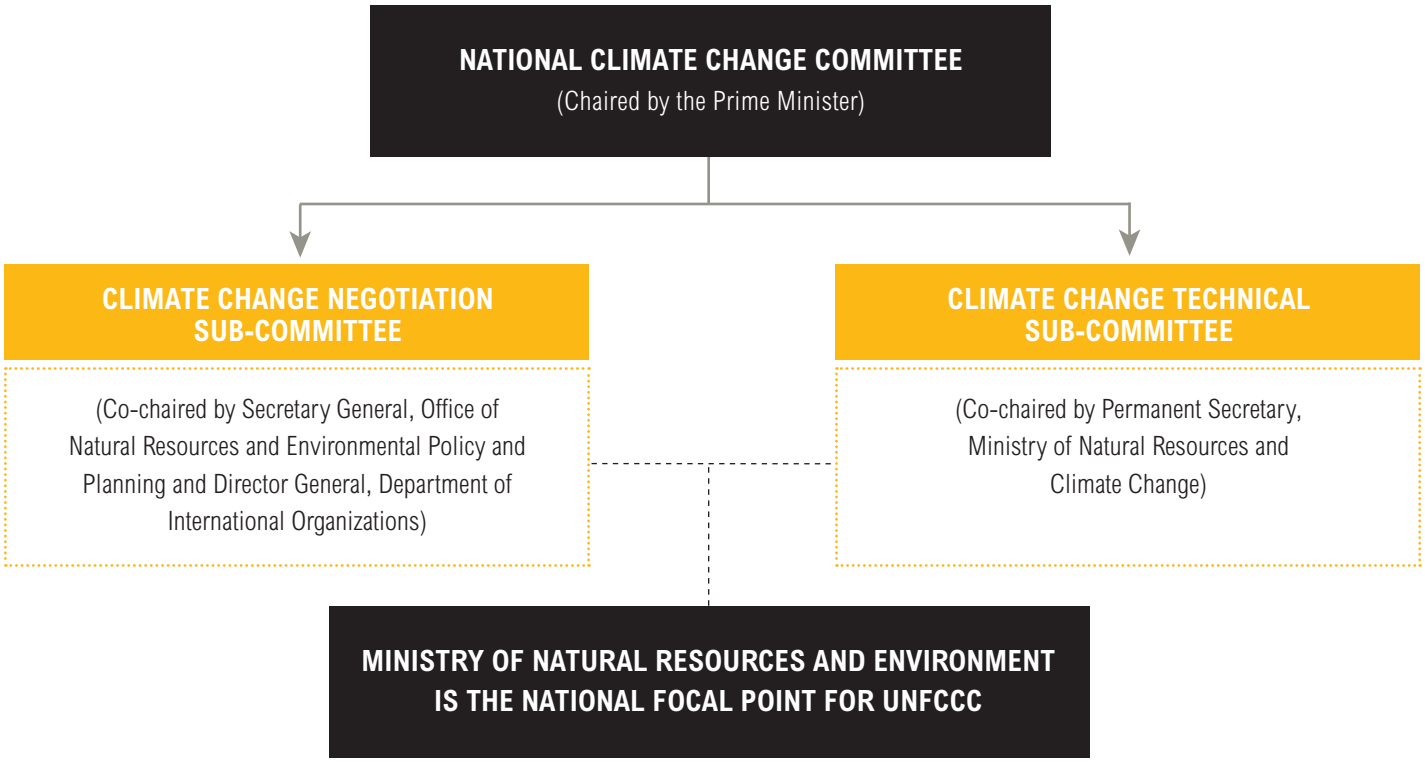
In order for Thailand to account for and report its GHG emissions consistently across the range of affected sectors and track the performance of its climate-related development plans, a GHG management system will be valuable. Many of the participants in the in-country interviews shared this view and saw the identification of GHG measurement and performance-tracking capacity needs as the first step to developing such a system.

CLIMATE CHANGE-RELATED INSTITUTIONS

The National Climate Change Committee, chaired by the prime minister, serves as the overarching climate change policymaking body in Thailand and guides the country's positions in international negotiations. The Office of Natural Resources and Environmental Policy and Planning (ONEP) and the Thailand Greenhouse Gas Management Organization (TGO) serve as the cosecretariat.

The Climate Change Negotiation Subcommittee and Climate Change Technical Subcommittee operate under the National Climate Change Committee (see Figure 4.3). The negotiations subcommittee is cochaired by the secretary-general of ONEP and the director general of the Department of International Organizations. The technical subcommittee is cochaired by the permanent secretary of the Ministry of Natural Resources and Environment (MoNRE).

Figure 4.3 | **Climate change–related institutional arrangements in Thailand**



Source: TGO 2012, p. 4.

While climate change policy planning and implementation is the responsibility of many related ministries in Thailand, MoNRE is the country's lead climate change institution. Under MoNRE, ONEP and the TGO share the majority of climate-related responsibilities. ONEP is the principal climate policy implementing agency and the point of contact for the UNFCCC. The TGO is an autonomous governmental organization that serves as the Designated National Authority for the Clean Development Mechanism (DNA-CDM) in Thailand and provides technical knowledge related to GHG management activities, such as voluntary corporate reporting and inventories.

4.6.3 Key measurement and performance-tracking capacity needs

The scoping reports identified specific capacity needs across a range of GHG measurement and performance-tracking focus areas, including national inventories, institutions, accounting for mitigation actions and policies, international reporting and performance tracking, forestry and land use, and electricity. While a full description of all of the identified capacity needs can be found in the accompanying report, Table 4.10 outlines a selection of these needs, chosen because of their cross-cutting relevance to more than one GHG management activity.[61]

4.6.4 Conclusion

Thailand is taking action to reduce emissions while facilitating socioeconomic development through a variety of national and sectoral development plans. A robust GHG measurement and performance-tracking system will be critical in enabling the country to understand the effects of these plans, improve outcomes, and report on progress.

While Thailand already has some capacity to design and implement such a system, our research suggests that further capacity-building efforts could be valuable across several areas, including human resources, institutions, information and technology, and financial (see Table 4.10).

Table 4.10 | **Select capacity needs in Thailand related to GHG measurement and performance tracking**[62]

CAPACITY CATEGORY	CAPACITY NEED
Human resources	**Skilled staff** The scoping report found that Thailand would benefit from having more professionals with technical capacity related to developing and maintaining a GHG accounting and reporting system (TGO 2012, p. ii). In addition, the country needs mechanisms for building and retaining technical expertise and knowledge of institutional processes related to measurement and performance tracking (TGO 2012, p. 16). **Verification** GHG information loaded onto an information management system needs to be verified by relevant experts (TGO 2012, pp. 32, 47).
Institutions	**Lead institution** The designation of one institution as responsible for leading and coordinating a national measurement and performance-tracking system, maintaining a GHG information system, and providing related technical capacity building to relevant agencies could be beneficial (TGO 2012, p. 47). **Legal structure** Existing laws and regulations do not cover or mandate GHG accounting and reporting, especially from the private sector. Therefore, laws and regulations that mandate GHG accounting and reporting in the public and private sectors and include simple and flexible accounting and reporting procedures would be valuable (TGO 2012, p. ii). **Framework for institutional cooperation** A framework is needed that enhances cooperation among all relevant agencies in order to develop climate-related policy, set emissions reduction targets and indicators, and include GHG information reporting as part of their official responsibilities (TGO 2012, pp. 48–49).
Information and technology	**Information management system** A consistent information management system across relevant agencies would be valuable, including a national information registry platform (Internet-based) or information pooling system, as well as a user-friendly information template for GHG reporting that covers all relevant GHG information and information management guidelines (TGO 2012, pp. ii and 47). **Policy tracking system** Thailand is facing new pressure to account for emissions reductions achieved; however, there is currently no system for tracking and quantifying the GHG impacts of policies and measures (TGO 2012, p. 12). The lack of information related to mitigation potential and GHG impact of mitigation measures is a primary reason why the country has not announced a national mitigation target (TGO 2012, p. 12).
Financial	**Mobilization of financial resources** There is no direct financial support for measurement and performance-tracking systems and activities (TGO 2012, p. 21). Financial resources need to be mobilized for human resource capacity building, to support relevant stakeholders in carrying out GHG-related data collection and management, and to support measurement and performance-tracking systems across relevant ministries and institutions (TGO 2012, pp. 21 and 49).

5. SYNTHESIS: TRENDS IN CAPACITY NEEDS FOR GHG MEASUREMENT AND PERFORMANCE TRACKING

JARED FINNEGAN AND THOMAS DAMASSA

Although the focus of the MAPT scoping research was to identify country-specific capacity needs in six countries, the research findings revealed a number of similarities or trends across countries. These "shared" capacity needs were found in each capacity category, encompassing an interrelated set of capabilities and human, institutional, technical, and financial resource needs. The sections below outline and describe common capacity needs and capacity-building opportunities across the researched countries. While these needs were identified based on research in six countries, they may hold relevance for other measurement and performance-tracking systems, regardless of country or jurisdictional level (e.g., national or subnational).

Table 5.1 | **Trends in capacity needs identified by scoping research**

CAPACITY CATEGORY	CAPACITY NEED
Human resources	■ Staff dedicated to measurement and performance-tracking activities ■ Staff with technical measurement and performance-tracking skills ■ Trainings for staff related to measurement and performance tracking ■ Accredited monitoring and verification personnel ■ Experience measuring GHG reductions from actions and policies ■ Improved technical capacity and staffing for corporate reporting ■ Training and capacity building for data collection
Institutions	■ Formalized system for data collection ■ Lead institution ■ Clarity of mandates, roles, and responsibilities to avoid duplication of responsibilities and activities
Information and technology	■ Data platform ■ Guidelines and standards for data collection ■ Reliable activity data ■ Regular data collection and analysis ■ Country-specific emissions factors ■ Improved performance tracking of mitigation policies ■ Appropriate GHG accounting methodologies ■ Guidance on accounting for upstream and downstream emissions ■ User-friendly reporting template for emitting entities and for civil society to use to monitor progress ■ Harmonized and comparable corporate reporting ■ High spatial resolution imagery in the forestry sector ■ Capability to model and project GHG trends ■ Mechanism to estimate GHG emissions ■ Robust quality assurance and quality control procedures ■ Verification
Financial resources	■ Adequate financial resources for hiring and retaining staff, training staff, and procuring necessary technologies

Table 5.1 outlines the capacity needs identified by the scoping research, divided by capacity category. It is meant not to offer a definitive list of needs but rather to elucidate the trends in capacity needs uncovered by our research. Addressing these needs will require targeted, country- and/or context-specific capacity-building efforts that take into account local circumstances, stakeholder preferences, barriers to implementation, and past successes.

5.1 CAPACITY TRENDS

The scoping research uncovered a need for dedicated staff at all levels of a GHG management system. In many instances, existing staff members are not dedicated to GHG management but instead perform tasks related to measurement and performance tracking in addition to their existing responsibilities, which overburdens them. Moreover, many countries and sectors need skilled staff with particular and specialized GHG management expertise and experience. Examples of needed areas of expertise include:

- national GHG inventory development and reporting;
- corporate GHG inventory development and reporting;
- accounting for GHG emissions reduction projects;
- assessing GHG impacts of policies and actions;
- sector-specific GHG accounting (e.g., in the forestry sector);
- GHG modeling and projections;
- data collection methods; and
- establishment and maintenance of data platforms.

Existing staff need ongoing training to enable them to carry out new GHG management-related tasks and responsibilities and apply best practice technologies and accounting methodologies. This training can include accreditation programs related to monitoring and verification, as well as trainings for new technologies and software.

Financial resources are also needed to hire and retain dedicated and skilled staff within all relevant measurement and performance-tracking institutions.

Institutional arrangements for GHG management systems depend on countries' national circumstances and objectives. A variety of objectives can guide the design of institutional arrangements, such as

- formalization of data collection systems;
- quantification of GHG effects of mitigation projects, policies, and actions (e.g., NAMAs);
- tracking progress toward mitigation goals;
- reporting progress domestically; and
- reporting relevant information internationally.

Regarding institutional capacity, relevant public and private GHG management-related institutions often need clearer roles and responsibilities. Many respondents identified the need for a lead institution within the national government to oversee and coordinate the entire measurement and performance-tracking system. In many instances, this role could be assumed by the national environmental agency, department, or ministry. Several countries that were part of this study have already identified lead institutions, while others are still in the process of doing so (see Section 3.3).

Furthermore, there is a need to define roles and responsibilities within and between each institution in order to avoid duplication of activities and streamline the overall process of measuring GHG emissions and tracking progress. The research found that in many cases institutional arrangements have evolved organically, without clear mandates detailing roles and responsibilities of key institutions, which can lead to confusion and inefficiencies.

Mandates can provide a crucial structure for sharing data and information and coordinating efforts across all levels of government—local, state/provincial, and national. For example, mandates can clarify institutional roles and responsibilities by granting authority to a lead institution to make data and information requests and mobilize resources, as well as detail how each relevant institution contributes to the overall GHG management effort. They can also ensure that measurement and performance-tracking procedures are integrated into the legal structure

of national climate change policies. Finally, mandates can grant public institutions the authority to collect data from private entities, such as corporate GHG inventory information and/or sector-specific activity data.

While mandates can outline how institutions are arranged and interact to carry out measurement and performance-tracking activities, there is also an overarching need for centralized data platforms that compile data across institutions and archive it in one central location, usually online. Specific data platform needs vary by country and can be general or sector-specific. Examples include:

- national inventory management system for regularly collecting and archiving emissions-related data across sources and sectors;
- data and calculation platform to support the monitoring and evaluation of mitigation policies;
- country-specific emissions factors and emissions sources database;
- technical infrastructure for national and subnational government agencies to collect, store, and report data in a consistent manner;
- corporate inventory data collection and management system; and
- a central database for organizing spatial information in the forestry sector from all public and private forest landowners.

When implemented well, data platforms can consolidate and organize information across a range of sectors and institutions, allowing information to flow more easily, be regularly updated and accessed by relevant actors, archive historical data and past calculations, harmonize information sharing between national and subnational governments as well as between public and private entities, and provide consistent data and emissions factors, which enable comparable emissions quantification across time and institutions.

In order to populate data platforms, the research found a need for robust, standardized, and country-specific data collection tools and methods. These may include standardized methods for government institutions to regularly collect data at the sector and/or entity level from private companies and government agencies.

Research further revealed a range of technological needs related to data collection. For example, in the forestry and land use sector, there is a need for high spatial resolution imagery technology in order to detect major drivers of forest cover change. To regularly estimate GHG emissions and analyze and project emissions trends, computer models are needed. And to collect data from emitting entities, user-friendly reporting templates are needed. To procure high-cost data collection technologies such as imagery technology and computer models, financial resources are also needed, while skilled staff is needed to set up and operate these technologies.

In order to carry out GHG quantification, all levels of the measurement and performance-tracking systems often need standardized and internally accepted methodologies. National and corporate inventory methods are available through the IPCC and GHG Protocol, respectively. However, governments need additional methodologies for quantifying the GHG effects of mitigation actions and policies (e.g., NAMAs) and for tracking and reporting progress toward mitigation goals. Moreover, there can be a need for sector-specific corporate inventory methodologies, such as methods for companies in the agriculture sector, and life cycle emissions methods that can account for upstream and downstream corporate emissions. Throughout the quantification processes, there is also a need for robust quality assurance and quality control procedures in order to assess the quality of data and GHG calculation procedures, as well as expert verification of GHG information.

Lastly, the establishment of a domestic measurement and performance-tracking system requires sufficient financial resources distributed adequately across the full range of GHG management activities. Financial resources underpin the proper functioning of the entire system and, as mentioned, are especially critical for hiring and retaining skilled staff within relevant GHG management institutions, building capacity among the broader public, and procuring necessary technologies, such as data platforms and software.

It is also important to note that capacity-building efforts around domestic measurement and performance-tracking systems for GHG mitigation have additional benefits that can contribute to wider sustainable development goals. For example, GHG management systems can incorporate and track non-GHG indicators, such as air pollution, congestion, jobs created, installed capacity of clean energy, and gains in research and development. Furthermore, emissions information gathered from measurement and performance-tracking systems can be used to calculate metrics such as emissions intensity per unit of output (e.g., GDP, industrial output, agricultural output) or cost per unit of emissions reduced, both of which can enable targeted efficiency gains.

5.2 COUNTRY ACTIVITIES ON GHG MEASUREMENT AND PERFORMANCE TRACKING

The importance of supporting capacity building in a timely and targeted way is critical, as many countries are already developing GHG measurement and performance-tracking systems to meet a variety of objectives, such as creating GHG inventories, measuring GHG impacts of mitigation actions and policies, tracking progress toward national mitigation goals, generating carbon credits, and preparing to meet international reporting requirements. For example, all six countries included in the MAPT project's scoping research continue to move forward with a variety of initiatives to further develop their GHG measurement and performance-tracking systems.

Under the National Policy on Climate Change, Brazil has developed a range of sectoral mitigation action plans. As part of this effort, the country is also developing processes for monitoring and evaluating the effectiveness of these plans. Until recently, national inventory methods have been the primary means for monitoring progress of mitigation efforts in Brazil. However, under the National Policy, each mitigation plan is required to specify sector-specific monitoring indicators for tracking performance and evaluating effectiveness. The Ministry of Environment is leading the process.

In Colombia, the national government is developing and implementing an MRV system for the country's low-carbon development strategy (LCDS). Institutional roles and responsibilities related to climate change policymaking have been defined by the National Planning Department. Further work is being done by the Colombian Government to define MRV-related institutional arrangements for the LCDS. Data needs for each of the sectoral mitigation strategies contained within the LCDS are being determined as are data collection methods. Indicators for tracking progress of NAMAs and other mitigation strategies are also being defined and developed.

Under the Climate-Resilient Green Economy (CRGE) strategy, Ethiopia is developing an MRV system to monitor outcomes of mitigation projects and ensure effectiveness. Furthermore, Ethiopia intends to sell carbon credits generated by mitigation projects and recognizes that this will require an MRV system, which is crucial for providing evidence and verification of GHG reductions.

India has developed a national inventory for 2007, making it the first developing country to publish emissions data for that year. The inventory included broader coverage of GHGs and emissions sources, as well as the increased use of country-specific emission factors. Moreover, India has well-established data collection systems in place, which may serve as a starting point for measuring and tracking performance toward the country's national mitigation goal. The Perform, Achieve, and Trade (PAT) scheme already has a robust, reliable, and transparent monitoring and verification mechanism and institutional arrangement.

South Africa is also developing a national monitoring and evaluation system that provides detailed, complete, and accurate emissions data. The two primary components of the proposed system will be emissions data, based on the national inventory, and data to measure the impact of specific mitigation actions and policies, collected from relevant entities. The system will help measure, report, and verify the progress of mitigation actions and

policies and track progress toward the country's national mitigation goal. South Africa also plans to use the outputs from its domestic monitoring and evaluation system to meet any future international reporting requirements under the UNFCCC related to emissions reductions.

Finally, Thailand has passed a number of national development plans that will work to reduce GHG emissions, including the National Master Plan on Climate Change. Although Thailand does not yet have a system for measuring and quantifying the GHG impacts of these plans, interviewed stakeholders recognize that such a system is valuable and necessary (TGO 2012). Thailand is standardizing the data needed for national inventory in all sectors and developing the MRV system for inventory and mitigation actions and policies. Moreover, many activities have been initiated to promote emissions reductions toward sustainable development in Thailand.

5.3 CAPACITY BUILDING THROUGH MAPT: ADDRESSING NEEDS AND OPPORTUNITIES

The research outlined in this report—carried out by WRI and its partners as part of the MAPT project—provides a preliminary assessment of GHG measurement and performance capacity needs in select developing countries as well as the basis for the identification of capacity needs trends. Having identified these needs and trends, the next step is to design effective and sustainable capacity-building efforts.

In each instance, capacity-building efforts need to take into account local circumstances, stakeholder preferences, and past successes. For example, efforts to build human resource capacity through staff trainings should be cognizant of language needs, learning styles, and existing knowledge; while efforts to build institutional capacity should be aligned with existing institutional arrangements, culture, authorities, and mandates. Moreover, if capacity needs are complicated or diffuse, such as a need for staff with GHG management expertise, then capacity building will require a multifaceted approach. Overall, capacity-building efforts should be targeted, informed by research, and aligned with stakeholder needs and objectives.

Under the MAPT project, capacity-building efforts focus on enhancing the capabilities and resources of government, business, and civil society in developing countries to design and implement credible measurement and performance tracking at the policy, national, and international levels. These efforts include the development of GHG accounting methodologies, trainings, case studies, and diagnostic assessment tools.

Identifying and understanding country-specific circumstances and financial, institutional, human resource, and technical capacity needs is fundamental to capacity development and enhancing domestic GHG measurement and performance-tracking systems. This report has presented findings from scoping research WRI carried out in six countries to identify GHG measurement and performance-tracking capacity needs. Our hope is that these data inform the work of those involved in capacity building for measurement and performance tracking. The findings will continue to guide the MAPT project's activities and thinking on capacity building.

ENDNOTES

1. The countries informing this research were selected in consultation with the project's funder and based on a number of different criteria, among them leadership in advancing climate policies, actions and goals; representation of different levels of capacity for measurement and performance tracking; regional diversity; and a previous track record working with WRI.
2. Domestic GHG measurement and performance tracking is closely related to domestic measurement, reporting, and verification (MRV). In the context of domestic MRV, measurement refers to the measurement of GHG emissions, either by direct measurement or the use of proxy data and indicators, such as activity data and emissions factors. Reporting is the public presentation of emissions measurements, data, and analysis. Verification is the process by which the accuracy of measurements, data, analysis, and calculations is reviewed by experts.
3. A GHG reporting program (which could be at the level of companies or that of facilities) broadly refers to reporting of GHG emission sources and emissions, which have been calculated and reported per established best practice. Refer to Section 3.2 for more information.
4. Monitoring and evaluating the effectiveness of mitigation actions, policies, and goals requires that countries and subnational jurisdictions have in place appropriate systems to account for GHG reductions achieved through individual mitigation actions and policies (using a bottom-up approach) and to track progress toward overall GHG reduction goals (using a top-down approach). Refer to Section 3.4 for more information.
5. For more information on NAMAs, see Hansel et al. 2012.
6. See UNFCCC 2011b.
7. Throughout this report, GHG management and GHG measurement and performance tracking are used as synonyms.
8. The six components were chosen for three reasons. First, each plays a significant role in a measurement and performance-tracking system. Second, WRI has expertise in each area and, therefore, is well positioned to assist in capacity-building efforts. Third, a variety of actors—from government, business, and civil society—are engaged across the components, which enables MAPT to simultaneously pursue "top-down" (led by government) and "bottom-up" (led by business and civil society) approaches that assist in the development of tools and methodologies and broad support for their uptake. Capacity-building efforts under the MAPT project will focus on these six components.
9. ERC only contributed to the industry component and was not involved in scoping relating to the other components.
10. For an overview of definitions, see Blagescu and Young 2006.
11. Adapted from United Nations Economic and Social Council 2006.
12. Based on Loubser 1994, as quoted in Blagescu and Young 2006.
13. MAPT also has an international component, which is not included in this table since no scoping research related to it was carried out.
14. For more information see http://www.wri.org/publication/seven-national-capacities-to-track-forest-emissions-and-removals.
15. Includes forest land, wood land, shrub land, bush land, plantations, and bamboo forests.
16. The "+" in REDD+ refers to additional activities including sustainable management of forests, conservation of forest carbon stocks, and enhancement of carbon stocks.
17. For the results of scoping reports for the other MAPT countries see: http://www.wri.org/our-work/project/measurement-and-performance-tracking-developing-countries.
18. See Fransen, Bhatia, and Hsu 2007 for further information on corporate GHG programs, their benefits and objectives, and examples of existing programs in different countries.
19. Ecological resources capacity does not apply to the corporate GHG accounting and reporting component and was not considered. Informational/knowledge capacity was considered as part of human resources and technical capacity.
20. Scoping reports can be accessed online at http://www.wri.org/our-work/project/measurement-and-performance-tracking-developing-countries.
21. Based on conversations with officials from the Environmental Protection Authority during the scoping exercise.
22. Based on conversations with representatives from the Ethiopian Environmental Protection Authority.
23. This example refers to tracking progress toward a GHG reduction from a base year in particular. However, mitigation goals can take a variety of forms (see Box 3.2).
24. The complete survey report, including survey methodology and participants, is available at http://www.ghgprotocol.org/mitigation-accounting.
25. Based on Osorio and Piva 2011, pp 18-23; Mogollon Duffo et al. 2011b, pp. 66-71; Fikreyesus et al. 2011, pp. 38-40; ABPS 2011, pp. 49-50; and TGO 2012, pp. 22-26.
26. Other than national inventories and project-based accounting (e.g., CDM).
27. Other than project-based methodologies (e.g., CDM).
28. This section does not include results from South Africa, since interviews related to mitigation accounting were not carried out in South Africa.
29. Based on Osorio and Piva 2011, pp 19, 27; Mogollon Duffo et al. 2011b, pp. 66-67, 75; Fikreyesus et al. 2011, pp. 38, 49; ABPS 2011, pp. 49-50, 73; and TGO 2012, pp. 22-23.
30. For more information on the Greenhouse Gas Protocol, please visit www.ghgprotocol.org.
31. See: http://unfccc.int/ghg_data/ghg_data_unfccc/items/4146.php.
32. For example, portions of the compilation and synthesis reports of initial national communications compiled by the UNFCCC: http://unfccc.int/national_reports/non-annex_i_natcom/compilation_and_synthesis_reports/items/2709.php.
33. In the country, the energy sector is the largest contributor to emissions. South Africa's Department of Energy (DOE) has authority to collect energy emissions data. However, DOE has no authority over Eskom—the country's largest energy supplier. Boyd et al. 2011, p. 21.
34. Under the Ministry of Natural Resources and Environment (MoNRE), ONEP and the TGO share most of the responsibilities related to climate change. While ONEP is the UNFCCC national focal point, the TGO performs its roles as the Designated National Authority for Clean Development Mechanism (DNA-CDM) for the Kyoto Protocol's flexible mechanism, together with promoting GHG management activities including provision of technical services and in-depth reports on GHG information; GHG Inventory; carbon business; capacity building; and mitigation actions in the country (TGO 2012, p. 4).
35. See http://www.mct.gov.br/index.php/content/view/326984.html#lista.

36. To prioritize case study topics, we conducted a series of informal interviews–by e-mail and telephone–with inventory experts in the MAPT countries. We also received input from practitioners in Germany, Kenya, Mexico, the Philippines, the United Kingdom, the United States, and Vietnam, and solicited feedback from experts at the UNFCCC, the United Nations Development Programme (UNDP), and the U.S. Environmental Protection Agency (EPA) leading other national inventory capacity-building initiatives.
37. WRI's work through the MAPT project will seek to build on and complement the body of existing work related to the capacity building being carried out by other organizations.
38. EGI's first focus was on policy and regulatory development. The MAPT project coincided with EGI's shift to focusing on implementation. For more about EGI, see http://electricitygovernance.wri.org.
39. Thailand is another country where civil society could be profitably mobilized once climate commitments are further developed in the international process.
40. Based on presentation by Oompie Aphane to the U.S. Department of Energy.
41. Subject to funding, activities could also be expanded to Thailand, Brazil and Indonesia, as there has been some interest in these countries, too.
42. For example, Open Climate Network is using this tool to assess policy implementation in Brazil's forestry sector. For more details, see http://www.wri.org/project/open-climate-network.
43. Taken directly from FGV 2011, p. 7.
44. For more information on the Brazil GHG Protocol Program, see http://www.ghgprotocol.org/programs-and-registries/brazil-program.
45. Unless noted otherwise, this table is based on Colombia's submission under the Copenhagen Accord as compiled in UNFCCC 2011a.
46. This NAMA was not included in Colombia's official submission to the UNFCCC under the Copenhagen Accord but instead as part of the country's entry in the NAMA database: http://namadatabase.org/index.php/Colombia.
47. This NAMA was not included in Colombia's official submission to the UNFCCC under the Copenhagen Accord but instead as part of the country's entry in the NAMA database: http://namadatabase.org/index.php/Colombia.
48. The National Development Plan is a quadrennial document published by the National Planning Department (DNP), which brings together Colombia's overarching development objectives and drives government budget allocations.
49. For the full results of the scoping research, see Mogollón Duffó et al. 2011b.
50. It should be noted that some of these capacity needs are cross-cutting and therefore may fit into more than one capacity category. For simplicity's sake, however, each capacity need was assigned to one category only.
51. For more information see: "National Mission for Enhanced Energy Efficiency (NMEEE)," India Environmental Portal, accessed Dec 4, 2012, http://www.indiaenvironmentportal.org.in/files/NMEEE.pdf.
52. Adapted from ABPS 2011, p.38.
53. More broadly, the Planning Commission is responsible for developing India's 5-year national development plans, which outline a long-term strategic vision for the country.
54. The interim report is available at http://planningcommission.nic.in/reports/genrep/index.php?repts=report_carbon.htm.
55. Many capacity needs identified by the scoping research are consistent with the findings of the Expert Group on Low-Carbon Strategies for Inclusive Growth. Consistent findings are noted with endnotes.
56. For the full results of the scoping research, see ABPS 2011.
57. It should be noted that some of these capacity needs are cross-cutting and therefore may fit into one or more capacity category. However, for simplicity's sake, each capacity need was assigned to one category only.
58. This was also a finding of the Expert Group on Low -Carbon Strategies for Inclusive Growth.
59. This was also a finding of the Expert Group on Low-Carbon Strategies for Inclusive Growth.
60. This was also a finding of the Expert Group on Low-Carbon Strategies for Inclusive Growth.
61. For the full results of the scoping research, see Thailand Greenhouse Gas Management Organization (TGO), "Measurement and performance tracking: Scoping and survey results, Thailand Report," (2011), http://www.wri.org/our-work/project/measurement-and-performance-tracking-developing-countries.
62. It should be noted that some of these capacity needs are cross-cutting and therefore may fit into one or more capacity categories. However, for simplicity's sake, each capacity need was assigned to one category only.

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