ANALYTICAL CAPACITY FOR LONG-TERM STRATEGIES

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All the interpretations and findings set forth in this case study are those of the authors alone.

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Effective planning for climate mitigation involves more than identifying near-term actions to reduce emissions. It also requires identifying long-term pathways to deep emissions reductions that provide the foundation for near-term planning. Recognizing the need for long-term strategies, the Paris Agreement calls on countries to design and communicate "mid-century long-term low GHG [greenhouse gas] emissions development strategies," which we here refer to as long-term strategies (LTSs).[1] This mandate from the Paris Agreement demands a more formal integration of analytical and technical assessment of potential LTSs with governmental planning and implementation processes. Such planning will be important not only for the Paris process but also for domestic efforts to meet long-term climate mitigation goals in concert with other societal goals, from air pollution reduction to energy access to preservation of biodiversity. Effective long-term planning, in turn, depends on the analytical capacity to explore future scenarios and strategies. To serve these roles, national analytical capacity in LTS development needs to be robust and durable, enabling engagement at the regular intervals necessary for mitigation planning and implementation, including those required under the Paris Agreement.[2]

In this short case study, we outline important elements of LTS analytical capacity. We provide several illustrative lessons from recent experience. Because of the limited number of countries that have formally undertaken LTS reporting under the Paris Agreement, we draw on three sources to inform our assessment: country cases of LTS planning, nationally determined contribution (NDC) engagement, and experience with more general climate scenario development and planning for policy.

We have selected five example countries for this review: Brazil, China, Germany, India, and the United States. These countries all have well-developed analytical capacities. Although their experiences may not be directly applicable to countries with fewer resources to draw on, they nonetheless provide a sense of the potential for variation in national approaches.

We assess the diverse approaches these countries have taken that inform the ongoing evolution of good practice in this space, particularly in issues relevant across country contexts. While the approaches in these countries are constructed to meet their national circumstances, the concepts that emerge from this review provide insight more broadly into the types of issues that countries should consider in developing a robust and durable analytical capacity for LTS development.

This case study is organized to highlight the actors associated with national capacity, the various ways that these actors have been organized and participated in LTS development, and the key issues associated with durable and effective national capacity. Specifically, section 1 discusses a common set of actors involved in integration of analysis into LTSs across countries. Section 2 focuses on the observations and experts' experience across five countries. Section 3 discusses common themes that emerge across the countries highlighted in this case study.

ADDRESSING NEW NEEDS FOR LTS PLANNING UNDER THE PARIS AGREEMENT

While LTS planning in the context of Paris presents new and unique challenges, the broader challenge of developing robust analytical capacity and then linking analytical inputs with policymaking is a familiar one. For example, for the case of climate change, the Intergovernmental Panel on Climate Change (IPCC) was designed as a central channel to interpret science-based results for a broader policy audience. But under Paris, many existing channels built to understand climate science and global energy transitions are not suited to the need to rapidly assess and understand opportunities for action domestically and internationally. For many countries, the need to contextualize their own domestic situations for mitigation and adaptation, particularly in light of the Paris requirements, has prompted increased demand for analytical capacity linked more directly to governmental processes—particularly for NDCs and LTSs.

Such national development of NDCs and LTSs requires consultation across diverse actor groups. These groups are the building blocks of national analytical capacity. Their roles and the way they interact define the national systems available for LTS development. Understanding these potential actors is therefore critical for understanding national capacities for LTS development, including those in place today and those that countries might strive to develop moving forward. While the specific groups will necessarily vary across countries, recent experience illustrates five major categories:

- **Government officials**. Government officials with responsibility in relevant departments are significant actors who engage in climate policy generation. Such actors often initiate requests for analytical activities.
- **Government staff and analysts**. Most governments have civil servants with topical expertise. Some governments have developed this internal capacity to include modeling or other analysis. Such analysts, if they remain in place for a sufficient period of time, can play an important role in facilitating interactions between the analytical community and policymakers. They often serve as translators of analytical information for use in decision-making.
- **Research institutions**. Research institutions are typically the primary source of national analytical capacity. They are often long-standing, durable institutions with staff that remain in place for years and therefore bring significant analytical skill and experience. The capacity in these institutions can remain constant even as governments and their priorities change. Types of research institutions include the following:
  - **Government-affiliated or direct-funded institutions.** Many countries, particularly those with greater resources to draw on, have established national laboratories or publicly funded research institutions. Such entities may be formally part of the government or independent but funded by the government.
  - **Universities.** Universities can serve as largely independent research centers. They can provide a critical part of the national analytical infrastructure, particularly in countries without national laboratories or internal government analytical resources.
- **Independent research institutions.** Think tanks and other independently funded, nongovernmental, nonacademic research organizations can provide additional diversity and cultivation of expertise.
- **Consulting firms**. Countries lacking capacity sometimes contract international consulting firms to provide analysis. A limitation of hiring such firms is that doing so is not an investment in domestic analytical capability.

- **Other civil society actors and organizations**. The broader world of industry and environmental nongovernmental organizations, international organizations, multilateral development banks, and other groups can also develop and provide important input to national processes.

Just as has been the case when integrating science and policy in other contexts, bridging between these communities is essential for integrating analysis into LTS planning and for implementing the resulting energy and climate policies.

ASSESSMENT OF ANALYTICAL STRATEGIES ACROSS FIVE KEY COUNTRIES

Both the NDC and LTS planning processes integrate similar groups of analytical, governmental, and nongovernmental communities. Because of the chronology of the negotiation of the Paris Agreement, however, there has been much broader experience with NDC development. Nearly all countries engaged in some kind of national process to develop their NDCs in advance of Paris. A much smaller set (numbering around 10) have to date formally delivered the LTSs called for under the Paris Agreement. Many countries have undertaken other planning efforts that include both climate and development strategies but have not yet formally undertaken an LTS specifically for the Paris Agreement.

This case study seeks to provide insight into the LTS experience in key countries. Because there is limited experience with LTSs specifically, we also draw from similar processes where appropriate. Below we provide a brief overview of how the analytical capacities in five key countries (Brazil, China, Germany, India, and the United States) were deployed and integrated in either the NDC or LTS efforts. This brief overview is based on literature and discussions with participants in those processes. It focuses explicitly on the nature of LTSs or related processes, the analytical capacity supporting these processes and constituting that analytical component of national LTS capacity more generally, and the way the analytical capacity is integrated into government strategy and planning.

Brazil

Process. Brazil has not yet produced a formal LTS for the Paris process, but it has done a similar, precursor assessment. Brazil's LTS effort can be traced back to 2012, when its federal government secured a $4 million grant from the Global Environmental Facility to produce a long-term climate mitigation scenario to support Brazil's position in Paris. The leading government institution behind that effort was the Ministry of Science and Technology (now called the Ministry of Science, Technology, Innovations, and Communications). Working with Brazil's research institutions, it produced the first integrated study to look at LTSs. The prospects for LTS planning under the current government are unclear.

Locations of analytical capacity. In Brazil, significant analytical capacity resides outside the government. Universities and university-based researchers in particular have been a major factor in climate mitigation planning in Brazil. For example, the Universidade Federal do Rio de Janeiro has focused on national and global issues related to energy and climate change, the Universidade de São Paulo has focused mostly on national energy issues, and the University of Campinas has focused more on regional issues, particularly biofuels, energy efficiency, and renewables. This university-focused, analytical infrastructure evolved initially in large part without signals or mandate from the government, although in recent years the government has frequently drawn on it for activities such as NDC development. In part because it has been developed to do more than support government mandates such as NDC or LTS development, the analytical capacity has proved durable and well-staffed. In addition to this university infrastructure, the Empresa de Pesquisa Energética (EPE), a public company that is part of the Ministry of Mines and Energy, was created by the Brazilian government to support national planning of the energy sector. The EPE produces regular scenario analyses of the Brazilian energy system.

Relation to government. Several channels exist for the research community to connect with policymakers. Ministries involved in climate change, such as the Ministry of Environment, the Ministry of Science and Technology (now the Ministry of Science, Technology, Innovations, and Communications), the Ministry of Finance, and the Ministry of Foreign Affairs, connect with the research community for advice on specific issues through both formal and informal channels. Sometimes the process is formalized through participation in, for example, climate delegations or discussion forums and working groups convened by government entities as well as government-funded projects. Additionally, technical staff from the lower government level sometimes engage directly with the research community. Starting under the presidency of Fernando Henrique Cordoso, the government also engaged in open discussions with the research community and civil society through the Brazilian

Forum on Climate Change. These conversations were initially conducted roughly once every two months, but the frequency dropped substantially under subsequent administrations. While this model is no longer operational due to the changes in government, the experience of building this close relationship between the research community and the president has nonetheless been an important aspect of the Brazilian model.

China

Process. China is currently undertaking a process to develop its LTS for the Paris Agreement. While not formally part of any international climate engagement, the Chinese five-year planning process has already created practices for including analytical input, much of it in the form of LTS-style modeling and analysis.

Locations of analytical capacity. China has a robust LTS analytical capacity. Two groups of analytical organizations are most involved in LTS analysis in China: universities (such as Tsinghua University and Renmin University) and research organizations under the government (such as the Energy Research Institute, the National Center for Climate Change Strategy and International Cooperation, the Development Research Center of the State Council, and the Chinese Academy of Sciences). Representatives from universities and research organizations often contribute to high-level decision-making by serving in advisory roles.

Relation to government. In recent NDC and similar planning processes, the Chinese Ministry of Ecology and Environment (or the National Development and Reform Commission before the government restructuring in 2018) has solicited input from experts outside government through both formal and informal channels.

China effectively links the policy and research communities. An example of a formal channel is the ongoing National Expert Committee on Climate Change. The committee, formed by senior researchers, directly advises high-level policymakers on domestic and international energy and climate change issues. In addition to high-level decision support, researchers from universities and government-affiliated research organizations have often taken on multiple roles in the process, including as policy advisors and sometimes even negotiators in the UN Framework Convention on Climate Change. This same group of researchers is frequently engaged not only in discussions on international policies related to climate change but also in domestic policies, such as the Chinese five-year energy policy planning process. This integration across long-term strategic policy and sectoral policies—such as renewable energy policy, industrial policy, or national inventories—creates linkages between near-term implementation and long-term policy.

Germany

Process. The German government delivered an LTS under Paris in 2017. This was developed through a broad participatory dialogue to construct its Climate Action Plan 2050. The analytical community supported this process, with backing provided by a collaboration between the Wuppertal Institute for Climate, Environment, and Energy; and the Institute for Energy and Environmental Research Heidelberg. This support focused on examining and consolidating proposals for measures, interpreting their methods and approaches, collecting feedback, and producing an expert assessment. It is also relevant to note that German climate policy takes place within the European context. The European Commission develops long-term strategies that inform the European Union's position in international climate change negotiations, and it just recently published a new strategy. European positions and strategies often serve as guidelines or context for member states.

Locations of analytical capacity. The German government does not retain specific, internal analytical capacities for modeling. Rather, government agencies normally commission assessments and propose regulatory policy. In addition, for policies of broader societal relevance, science-policy engagement in Germany has relied primarily on ad hoc or time-limited commissions that focus on particular tasks (such as the coal exit commission or the nuclear phaseout commission). As a result, much of the German analytical capacity resides in external research institutions. The German system channels funding support to independent research organizations with core funding. Additional contracts can be bid out on individual issues and projects, taking the form of research grants (typically funded by the Ministry for Science) or commissioned studies (typically funded by the ministry responsible for policy formulation and implementation). During that bidding process, these research institutes are competing with universities, consultancies, and private research institutions. Several institutes fill this role, depending on the type of funding. For example, the Potsdam Institute for Climate Impact Research (PIK) does substantial modeling mostly through research grants along with other European Commission–funded organizations such as the Netherlands Environmental Assessment Agency and the International Institute for Applied Systems Analysis. Private

research organizations such as Öko-Institut, Navigant, Prognos, Climate Analytics, and NewClimate Institute are major providers of commissioned studies. In addition to German funding, the European Union has a track record of continuously funding research consistent with LTS development. This research funding has been key to sustaining analytical capacity for LTSs across European research institutions, including those in Germany. The European Union also has in-house analytical capacity (Joint Research Centers) that produce analyses relevant to German climate policy.

Relation to government. The core funding mechanism from the federal government means that research institutions commonly work directly with government, especially in the context of commissioned studies. Historically, funding support for climate change analysis has been relatively high and stable.

India

Process. India has not yet submitted an LTS under the Paris Agreement. It has, however, begun a process for developing LTSs involving several Indian modeling teams. It is not yet clear whether this process of developing LTSs for India will be used to inform the Indian LTS under the Paris Agreement.

Locations of analytical capacity. Most analytical capacity in India resides outside the government. In addition to some well-established institutions (e.g., the Energy and Resources Institute, the Indian Institutes of Technology, the Indian Institute of Management Ahmedabad), a growing number of newer institutes in India are working on energy and climate change (e.g., the Council on Energy Environment and Water; the Center for Study of Science, Technology, and Policy; and Integrated Research and Action for Development). While there was formerly some internal capacity at the Planning Commission, the National Institute for Transforming India (called NITI Aayog) was formed in 2015 to serve as the government's internal think tank to bridge all relevant ministries and research organizations, forming an advisory board for government planning. NITI Aayog develops energy strategies or policies, largely relying on external research institutions. NITI Aayog is now building internal modeling capacity to supplement the external capacity that it draws upon. The Ministry of Environment, Forest, and Climate Change is similarly developing internal modeling capacity.

Relation to government. The Indian government typically constitutes high-level expert committees through which civil society and think-tank experts are formally engaged in informing the national strategy on climate change, as and when required. The major research institutes house many senior researchers who either previously were in the government or are consulted by senior government officials. Many of the institutes have developed explicit communication strategies to connect with the government through these senior researchers. In some cases, this network-based model can lead to different groups working for different ministries independently, in part because ministries act independently in their planning activities and in part because of individual relationships between research institutes and specific ministries.

United States

Process. The United States delivered its LTS (known as the U.S. Midcentury Strategy or MCS) in 2016. However, the country does not have a formal long-term planning process beyond the standard federal interagency process.

Locations of analytical capacity. The United States has historically invested significantly in developing internal analytical capacity within the federal government. While many federal agencies have capacity relevant to their own areas of specialization, the most significant for climate and energy planning have been the Department of Energy (DOE), the Environmental Protection Agency (EPA), the Department of State, and the Department of Agriculture (USDA). The White House (the Executive Office of the President) functions as a mechanism to bring agency expertise-makers together, but the levels of career staff at agencies dwarf the small number of staff working in any particular White House. In addition, the DOE supports a set of 17 national laboratories, many of which carry out some work on energy issues relevant to climate and low-carbon energy. These national laboratories are largely funded by the federal government, but they also receive funding from external sources, such as private industry and foundations. The MCS was organized by the Obama White House and relied on analytical support from DOE, including DOE's national laboratories and DOE's Energy Information Administration, and the Department of Agriculture. This emphasis on strong in-house analytical capacity within the U.S. government and affiliated national labs forms the core of the U.S. approach to formal analytical capacity. In addition to this major internal capacity, however, the United States has numerous universities, think tanks, and other research organizations that house substantial analytical capacity and that regularly engage with the government.

Relation to government. The robust set of research organizations in the United States creates a large pool of expertise to feed into government decision-making at multiple levels in the U.S. federal system—including cities, states, and the national government. Depending on its political priorities, the White House can call on experts from either other government agencies or the nongovernmental research community to work on specific issues. A strength of the U.S. system is its resilience to changing priorities. Most institutions that support LTS development also engage in a wide variety of additional analytical activities and are therefore able to maintain capability even as administration priorities change.

DISCUSSION

In this case study, we have presented brief overviews of the national models of analytical capacity in specific countries. All have specific circumstances that drive the process and illustrate the diversity of potential approaches to building, retaining, and utilizing analytical capacity for LTS processes. Because of this variety of possible models of analytical capacity in different countries, there are no absolute requirements for processes that might yield the most robust and durable national systems. Nonetheless, several features of the countries highlighted in this case study emerge as important considerations in creating robust and durable national systems for LTSs and related processes:

- **Durable analytical capacity is housed in durable institutions**. There is no single "right" place to house analytical capacity. Countries that have successfully developed durable capacity, however, have achieved this by housing researchers in durable institutions that allow researchers sufficient time to develop experience and links to the government, as well as to establish processes that utilize those experts. In countries with greater funding capacity, an emphasis on national laboratories or internal governmental institutions may prove most appropriate. In other countries, an emphasis on universities or other types of independent research organizations may be most suitable.
- **Long-term stable funding supports durable analytical capacity**. Just as durable institutions are required to nurture capacity, so too is long-term funding necessary to support capacity development. In some cases, funding may come from governmental institutions. In other cases, external funding (both public and private) may provide a buffer against shifting government priorities. For institutions with politically dependent funding, a diverse portfolio of related analytical activities is valuable to withstand changes in government priorities. Some level of funding focused specifically on capacity development, as opposed to funding for specific studies or outputs, can be foundational for the development of analytical capacity.
- **National systems of analysis integrate across all actors, from those producing analysis to those incorporating analysis into decision-making**. National LTS capacity is ultimately about the combined efforts of those who generate analysis, those who request it, and those who interpret it and prepare it for use in policymaking. National systems for LTS development are most successful when the different actors are effectively integrated, including coordination across institutions and government agencies. Moreover, integration is most successful if it is repeated. Systems that generate regular interactions between government staff and analysts build relationships that lead to better directed analysis and more effective uptake of that analysis to support decision-making.
- **Engagement with international analytical communities can broaden expertise**. Learning is essential in the field of integrated analysis and policy. Engaging with groups outside of the national context is an essential part of this process for all countries. Although not highlighted in this case study, analytical institutions in all of the countries discussed above engage in international modeling and analysis activities as a means to continue to build capacity. For countries with nascent capacity, such international interactions may be particularly beneficial; however, such activities require substantial resources and are therefore most common for countries with the most established analytical capacity.

This case study highlights and describes some of the key elements of robust national analytical capabilities for LTS development. At the same time, it has not explored the real and significant challenges that countries might face in developing, maintaining, and utilizing such capacity. These challenges may

include, for example, inability to obtain consistent funding, limited domestic human resources for modeling and analysis, and frequently changing government staff, which limits government capabilities to interact with and digest analysis. The nature of these challenges varies across countries, but they are generally of greater significance in countries with fewer resources. This critical topic, and strategies for overcoming associated challenges, can be usefully discussed across the community to inform more effective development and use of LTS analytical capacity.

ENDNOTES

1. In this case study, we use LTS to refer to any long-term mitigation strategy and not just those called for in the Paris Agreement.
2. Note that this case study focuses on LTS planning in the context of climate mitigation. The Paris Agreement also calls for planning in the context of adaptation. We do not address long-term adaptation planning here, but many of the lessons in this case study would be relevant to adaptation planning.

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