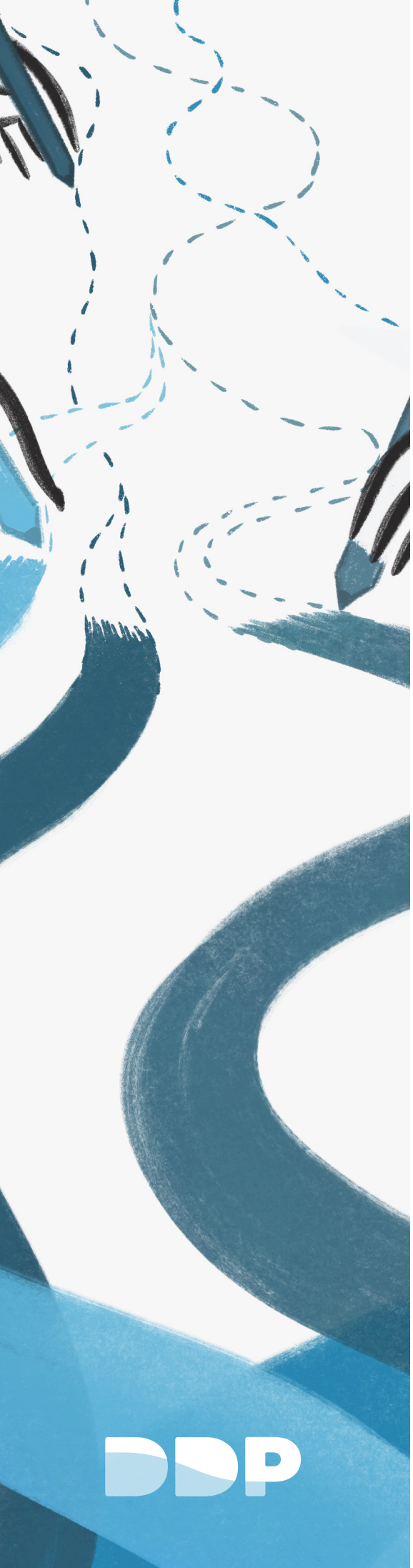

GUATEMALA
PATHWAY TOWARDS LOW-CARBON DEVELOPMENT

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GUATEMALA'S TRANSITION IS NOT JUST ABOUT REDUCING EMISSIONS, BUT TRANSFORMING WHAT DRIVES THEM

Guatemala stands at a moment of profound opportunity. The country is one of the most biodiverse in Central America. These natural resources are not only globally significant but essential to the well-being, identity, and livelihoods of Guatemalans across urban and rural areas. At the same time, Guatemala faces high climate vulnerability, especially from floods, droughts, and shifting agricultural patterns, underscoring the urgency of climate-resilient development (CATIE, 2024).

This dual reality (i.e., rich natural capital alongside developmental and climate challenges) makes Guatemala uniquely positioned to outline a low-carbon development pathway that aligns emissions reduction with improvements in human well-being. The country's structural development challenges, such as poverty, energy access gaps (~10% of the population remain without access to electricity (Ministerio de Energía y Minas, 2022)), deforestation (from 2001 to 2024, there was a 25% reduction in the 2000 forest cover, equivalent to 1.89 Mha of tree cover (Global Forest Watch, 2024)), and waste management deficits, are not merely obstacles but gateways for transformative solutions that can drive inclusive growth while attending the underlying drivers of emissions.

For instance, agriculture and forestry remain at the heart of the Guatemalan economy, supporting millions of livelihoods. Yet these same sectors also contribute significantly to national greenhouse gas (GHG) emissions. In 2018, the LULUCF sector (i.e., Land Use, Land-Use Change and Forestry) accounted for approximately 50% of emissions, primarily from deforestation and land-use change (Ministerio de Ambiente y Recursos Naturales, 2022). Expanding agricultural frontiers and the use of firewood for cooking have placed pressure on forests. This is an issue that simultaneously affects biodiversity and public health.

At the same time, the country's energy and transport systems are evolving in the face of rapid urbanization. Fleet growth (e.g., after the COVID-19 pandemic, the number of motorcycles increased by 30% (Superintendencia de Administración Tributaria, 2025)), outdated public transport infrastructure, and a surge in second-hand vehicle imports have increased congestion and fossil fuel consumption. While the electricity matrix has begun to diversify, a significant portion of the population depends on biomass fuels with high emission implications and health risks. In fact, firewood is the main source of energy in the country, underscoring how there are shared opportunities and benefits to be unlocked with a low-carbon transition across sectors (e.g., LULUCF and Energy, in this case). In 2018, the energy sector, including transportation, accounted for 33.8% of national emissions.

Guatemala's emissions have grown steadily since 2005, according to the 2022 National Greenhouse Gas Inventory –from 53 Mt CO_2eq in 2005 to 62 Mt CO_2eq in 2018– (Ministerio de Ambiente y Recursos Naturales, 2022). This trend reflects both economic growth and has been mostly driven by an expanding energy demand, but also highlights the opportunity for leapfrogging into sustainable, low-emissions technologies. The decomposition of CO_2 emissions across sectors reveals clear entry points for change: modernizing transport systems, scaling renewable energy, and preserving forest ecosystems.

In line with centering development opportunities in emission reducing efforts, when we look at the waste management sector, over 45% of households still burn their waste, contributing to air pollution and related health burdens (Instituto Nacional de Estadística, 2018). The Ministry of Environment and Natural Resources (MARN) has made this issue a central part of its agenda, recognizing that even though its contribution to emissions is small (~3%), better waste infrastructure and practices (e.g., circular economy) can improve local environments and the population's health (Ministerio de Ambiente y Recursos Naturales, 2022; Ministerio de Ambiente y Recursos Naturales, 2024).

Rather than treating emissions as the end goal, Guatemala's low-carbon transition has started to be fundamentally about transforming the development model and recognizing the co-benefits in emissions reductions that comes with that. It is about shifting towards a system that values natural capital, increases productivity, improves health, and builds resilience to future shocks.

THE ENDBE AND CENTERING DEVELOPMENT IN LONG-TERM CLIMATE PLANNING

The National Low-Carbon Development Strategy (*Estrategia de Desarrollo con Bajas Emisiones*, ENDBE) is a long-term planning instrument that plays a central role at guiding and aggregating Guatemala's national targets towards low-carbon development. It serves as a roadmap for Guatemala's climate policy by promoting the reduction of greenhouse gas emissions with targeted actions across all emitting sectors (Ministerio de Ambiente y Recursos Naturales, 2021).

As required by law, Guatemala has been working on updating their ENDBE over the last two years. During this process, the country has made a fundamental stance in how it approaches climate policy, establishing a model for others to follow. Rather than focusing narrowly on emissions targets, this updating process has adopted a development-centered lens. It sees mitigation

as a pathway to achieve broader societal goals: improved public health, rural development, enhanced productivity, and long-term economic resilience.

The ENDBE was first developed in 2018 and submitted to the United Nations Framework Convention on Climate Change (UNFCCC), in 2021 as part of Guatemala's long-term low-emission development strategy. The ongoing update process, supported by international partners and national institutions, significantly expands on this foundation and focuses on prioritizing a strong participatory process to strengthen sectoral ownership of the strategy and its targets. The country has been working on developing improved modeling using the OSeMOSYS platform, robust decision-making frameworks, and a detailed cost-benefit analysis. Importantly, this update process has focused on setting a clearer vision: not limited to emissions reductions but extending further into the cost and benefit implications of each action. The process sought to incorporate the most recent data into the models, updated sectoral policies by consulting with stakeholders on the key policy instruments to consider in this ENDBE update, and ambitious yet feasible pathways based on historical adoption rates and institutional capacity. In fact, this modeling effort was developed with a forward-looking approach, aiming to serve as a foundation for future processes, particularly the updating of the Nationally Determined Contribution (NDC).

A cornerstone of the ENDBE update is its emphasis on co-benefits. Modeling tools have been able to prove that implementing ENDBE's actions and targets could yield significant benefits between 2025 and 2050. These benefits stem from reduced fossil fuel imports, lower healthcare costs, job creation in green sectors for instance in circular economy and improved environmental quality. The analysis underscores that climate action is not a trade-off against development, but a catalyst for it.

Participation has been a key strength of the update process. More than 150 stakeholders took part through workshops, over 40 bilateral meetings, and validation sessions. Participants included government ministries, local governments, private sector actors, academic experts, indigenous and community-based organizations, and civil society groups. This process not only enhanced the technical quality of the strategy but also pursued broad-based ownership and ensured that the strategy was grounded in the realities, priorities, and constraints of each sector and the entities responsible for implementation. At the same time, it is important to recognize that a broad participatory process can compromise pre-established timelines to finalize a Long Term Strategy (LTS) and be a complex endeavor, particularly when working toward consensus among a diverse set of stakeholders. For this reason, documenting agreements carefully and treating the LTS as a living document (i.e., one that can be updated and adjusted as new realities emerge) is essential to maintaining its relevance.

Institutionally, the ENDBE is designed to play a guiding role in the evolution of Guatemala's climate governance. It is expected to inform the next update of the NDC, the update of the National Climate Change Action Plan (Plan de Acción Nacional de Cambio Climático, PANCC), and sectoral development plans. The PANCC and the ENDBE are both LTSs that inform climate policy from different perspectives. The ENDBE sets long-term quantitative mitigation targets for each sector (e.g., the share of renewable energy to be deployed, the percentage of electric vehicles to be introduced, among other targets). The PANCC, on the other hand, focuses on defining the specific strategies that government institutions will follow to achieve the country's climate change mitigation and adaptation goals (i.e., it emphasizes the means of implementation that entities will pursue).

The ENDBE's modeling and financial analysis components have also served as a bridge between sectoral planners and the Ministry of Finance. For instance, the cost-benefit analysis can support the integration of climate goals into budgetary planning, a critical step toward mainstreaming climate policy across government institutions.

KEY INSTITUTIONAL AND REGULATORY CHANGES HAVE HAPPENED IN THE LAST DECADE

Over the past ten years, Guatemala has made notable structural changes that lay the groundwork for low-carbon development. These changes span institutional arrangements, policy frameworks, and sectoral initiatives. At the institutional level, one of the most significant advances is the active involvement of the Ministry of Public Finance (MINFIN) in climate planning. Their participation in the ENDBE process marks a turning point in integrating climate considerations into public investment and fiscal planning. MINFIN's role in developing financing scenarios and identifying budgetary implications of mitigation measures is critical for future implementation.

In fact, a key milestone is the development of the ENDBE financial dashboard. This tool translates the ENDBE's cost-benefit analysis into relevant indicators for financial and budgetary planning. The tool sought to be a starting point for a new level of integration of the Finance Ministry into the climate process. This dashboard was based on a dashboard developed by the Institute for Climate Economics (I4CE, 2022).

The creation and strengthening of technical working groups ("mesas técnicas") in areas such as climate change mitigation and adaptation have provided spaces for policy dialogue and coordination. These platforms bring together diverse stakeholders from key sectoral institutions to identify challenges, share knowledge, and develop consensus-based solutions. For instance, the creation of a sustainable agriculture working group enabled the coordination among stakeholders to create a concrete plan to pursue sustainable agricultural practices under a shared model. They have become instrumental in aligning sectoral plans and visions with national climate goals.

Several sectoral reforms have also contributed to enabling climate action. The PROBOSQUE program, which incentivizes forest conservation and reforestation, has become a central pillar of mitigation in the land-use sector. It provides economic incentives to landholders and communities, supporting sustainable forest management and ecosystem restoration (Instituto Nacional de Bosques, n.d.).

In the energy sector, regulatory advances include the introduction of mandates for biofuel blending. The 2023 regulation sets a pathway for ethanol blending in gasoline, starting with 10% (E10) in 2026 and increasing over time (Ministerio de Energía y Minas de Guatemala, 2023a). This measure is expected to reduce fossil fuel dependency and stimulate local bioenergy markets. In parallel, the National Energy Efficiency Policy 2023-2050 (Ministerio de Energía y Minas, 2023b) and the update of the 2020-2050 Rural Electrification Policy (Ministerio de Energía y Minas, 2020) aim to expand access to clean and modern energy services. In 2024, the Ministry of Energy and Mines presented their electricity generation expansion plan, where Guatemala sets the goal of achieving 80% of renewable energy by 2027 (Ministerio de Energía y Minas, 2024).

In waste management, the 2024 launch of the National Strategy for Circular Economy (ENECG) marked a paradigm shift (Ministerio de Ambiente y Recursos Naturales, 2024). The strategy promotes waste reduction, material reuse, and value-chain development, moving away from traditional disposal models. These sectoral initiatives also highlight the country's vision of pursuing low-carbon initiatives that support Guatemala's development goals.

ENABLING CONDITIONS THAT WILL SUSTAIN LOW-CARBON DEVELOPMENT

Guatemala is making determined strides toward low-carbon development, and these efforts will be further strengthened by a set of enabling conditions that are progressively being consolidated. Financial readiness is one of the most important enablers. Through the ENDBE update, the country has developed detailed investment scenarios for different levels of ambition. These scenarios

identify sector-specific investment needs, providing a roadmap for engaging both domestic and international resources. As a result, the country is now in a strong position to understand the scale and distribution of its investment needs, which in turn enhances its ability to engage effectively in climate finance discussions and funding proposals.

What remains, however, is to fully address the implementation challenge and unlock access to the required climate finance at scale. Turning plans into action will require not only continued political will and technical capacity, but also well-defined mechanisms for financing, coordination, and monitoring. Consolidating project pipelines will be essential to translate ambition into results on the ground.

From their climate planning and reporting processes, Guatemala understands that the forestry sector offers substantial mitigation potential and multiple co-benefits, especially considering the contribution of land-use change to the country's emissions. The country has prioritized conservation, focusing on reducing deforestation in existing forests through programs such as PROBOSQUE not only reduce emissions but also enhance ecosystem services, biodiversity, and rural incomes. Promotion of clean cookstoves further contributes to forest protection while addressing health concerns related to indoor air pollution, which disproportionately affects women and children (Ndikubwimana, A. et al, 2025).

In transport, the country has been clear about increasing electric mobility and enhancing public transit. Implementation of mass transit systems in major urban centers will reduce traffic congestion and accidents, and improve air quality (Agencia Nacional de Alianzas para el Desarrollo de Infraestructura Económica, n.d.). These projects also support social inclusion by providing affordable and efficient mobility options for low-income populations.

The waste sector has made progress through policy reforms and increased awareness, but infrastructure development remains essential. The ENECG and other regulatory instruments have laid the groundwork for a transition to circular economy practices. However, the next phase requires investments in sanitary landfills, methane capture systems, and material recovery facilities. Strengthening coordination between national and local governments will be crucial for implementation. An essential next step will be the development of local waste management plans, as many local governments are already doing, tailored to the specific realities and waste generation patterns of each community, with the creation of local baselines of waste generation as a first step.

Capacity building and institutional strengthening are also necessary enablers. While technical capacity has improved, many institutions still face limitations in staffing, data management, and project execution. Continued support for training and knowledge exchange between local institutions will be vital to maintain momentum.

Guatemala has identified limited inter-institutional coordination as a persistent challenge for fully articulated climate action. Addressing this challenge has required deliberate efforts to improve dialogue and foster joint ownership of the transition. For example, as mentioned before, the government has established working groups that bring together key institutions to develop shared policies and priorities. The modelling effort for the future ENDBE update also illustrates Guatemala's commitment to a participatory approach: stakeholders from across government, the private sector, and civil society contributed insights that helped shape investment scenarios and policy options. This approach aims at strengthening buy-in and the co-creation of climate policy.

The country has also recognized that co-existence of a large number of actors across sectors creates challenges for coordinated climate action. With many actors involved—such as farmers, municipalities, and private enterprises—there are limitations in how information is shared and how stakeholders access the data needed for informed decision-making. To address this, Guatemala has developed tools such as the Agroclimatic Information

Bulletins ("*Boletines Agroclimáticos*"), which provide producers with climate information to guide agricultural practices (Ministerio de Agricultura, Ganadería y Alimentación, 2025). In addition, the government has advanced the establishment of the National Climate Change Information System ("*Sistema Nacional de Información de Cambio Climático*"), designed to centralize and disseminate climate-related data, thereby strengthening transparency, coordination, and evidence-based policymaking (Ministerio de Ambiente y Recursos Naturales, n.d.).

EXISTING CLIMATE GOVERNANCE IS ADVANCING TOWARDS INTERINSTITUTIONAL COLLABORATION AND ALIGNMENT

At its core, the Ministry of Environment and Natural Resources (MARN) leads national climate planning, overseeing coordination of key instruments such as the ENDBE and the PANCC. The *Mesa Técnica de Mitigación* and the *Mesa Técnica de Adaptación* provide institutional spaces for dialogue, knowledge sharing, and consensus building across government sectors. These platforms bring together representatives from a wide range of sectors. They have played a pivotal role in shaping the ENDBE update and ensuring consistency with sectoral priorities and national development goals. These working groups also provide a mechanism for continuous learning and feedback, which is essential in a dynamic policy environment shaped by evolving climate science and international commitments.

Beyond MARN, several institutions have responsibilities that are critical to climate action. The National Council for Protected Areas (CONAP) and the National Institute of Forests (INAB) are responsible for forest governance and conservation. Their overlapping areas of focus highlight the critical need for securing coordination. Similarly, the Ministry of Agriculture, Livestock, and Food (MAGA) manages sustainable land use and agricultural practices, while the Ministry of Energy and Mines (MEM) governs energy policy. The participatory approach adopted during the modelling effort for the ENDBE update exemplifies Guatemala's commitment to inclusive governance. Indigenous groups, women's organizations, youth associations, and municipal authorities were all consulted. Their contributions were essential in shaping a strategy that reflects national realities and diverse perspectives. The overall broad participation in the update process enhanced both the technical relevance and political legitimacy of the strategy. However, it also highlights the cross-sectoral commitment of the country to low-carbon and resilient development.

Nevertheless, there are next steps. In order to enhance inter-institutional collaboration, the country is working to understand what the adequate platforms are to share information, perspectives, and align incentives. Moving forward, Guatemala intends to strengthen institutional frameworks that reinforce coordination at all levels of government, from national ministries to local municipalities. In the same line, the country will continue to strengthen the link between climate policy and development goals. For instance, during participatory processes for climate policy development, emphasis is placed on how climate action can secure resilient rural energization, expand access to clean cooking options that reduce exposure to indoor air pollution, safeguard ecosystem services through forest conservation and sustainable agricultural practices, and reduce pressure on waste management systems through the implementation of circular economy approaches. These efforts are intended not only to enhance environmental outcomes, but also to generate social and economic co-benefits (e.g., poverty reduction, improved public health, and employment opportunities) ensuring that the transition remains coherent with the country's broader development priorities.

INTERNATIONAL COOPERATION FOR IMPLEMENTATION AND THE ROAD AHEAD

International support has been instrumental in enabling Guatemala's climate planning achievements. Development partners such as the Inter-American Development Bank (IDB), UNDP, the 2050 Pathways Platform, and various bilateral agencies have contributed technical assistance, capacity building, and financial resources. Their efforts have been vital in strengthening climate planning, enhancing MRV systems, and mainstreaming climate change across sectors.

As Guatemala transitions from planning to implementation, the nature of international cooperation must evolve accordingly. The next phase will require scaled-up climate finance to support infrastructure projects, technology deployment, and institutional development. The ENDBE's investment scenarios indicate substantial financing needs to meet mitigation pathways.

Guatemala is well-positioned to attract international climate finance. The updated models for the ENDBE future update features detailed cost-benefit analyses and prioritization frameworks, strengthening the country's case for investment. It highlights high-impact interventions with strong returns in emissions reductions, development co-benefits, and long-term resilience. For example, the promotion of clean cookstoves simultaneously mitigates emissions, improves health outcomes, and curbs deforestation.

Multilateral climate funds can play a key role. Blended finance instruments and public-private partnerships are also essential for mobilizing capital at scale and unlocking sectoral opportunities. In this context, international partners can support the development of robust project pipelines and assist local institutions in meeting access criteria for international funding.

Beyond financial support, technical strengthening remains equally important. Prioritizing data systems, policy design, and institutional capacity is needed to maintain momentum. Peer-to-peer exchanges with countries on similar trajectories can foster innovation and shared learning.

Looking forward, several strategic priorities will shape Guatemala's low-carbon development pathway. First, placing adaptation at the center of the climate agenda is essential. While the ENDBE focuses primarily on mitigation, Guatemala's vulnerability to climate impacts (e.g., droughts, floods, and temperature variability) demands robust adaptation planning. Integrating adaptation into development and infrastructure strategies will enhance resilience and reduce long-term risks. In fact, multiple mitigation initiatives such as reforestation, conservation, agroforestry systems, renewable energy, among many others, are a clear bridge between the mitigation and adaptation agenda.

The upcoming update of the NDC and the revision of the PANCC provide important opportunities to align mitigation and adaptation efforts. These instruments are expected to reflect the integrated nature of climate challenges, prioritize co-beneficial actions, and maintain coherence with the ENDBE. Leveraging the analytical tools and data developed through the ENDBE will be key to improving their ambition, quality and incorporating new perspectives from stakeholders.

Ultimately, implementation is the final frontier. Achieving the vision set out in the future update of the ENDBE will require strong governance, predictable financing, and broad-based societal support. Scaling successful pilots, aligning regulatory frameworks, and empowering subnational governments will be essential for delivering results on the ground. Investment in human capital (e.g., training programs and community engagement and involvement in climate change mitigation, adaptation and risk management) will serve as the foundation of implementation success.

The path ahead is challenging but achievable. Guatemala has laid a solid foundation grounded in evidence, participation, and ambition. With continued domestic leadership and adaptive international cooperation, the country can transform its emissions trajectory into a model of climate-compatible development. It can be one that reduces emissions while delivering prosperity, equity, and sustainability for generations to come.

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