Aligning Climate and Economic Planning: A Guide for Integrating Macroeconomic and Financial Dimensions

February 2026

Part of GGGI's technical guidelines series

1. Green Growth Planning Guidelines, Jin Young Kim, Robert Mukiza, Mohammed Angawi, and Nobert Maass, 2016.
2. Green City Development Guidelines, Nguyet Minh Pham, Daniel Buckley, Adam Ward, Okju Jeong, and Julie Robles, 2016.
3. Pro-poor, Inclusive Green Growth: Experience and a New Agenda, Steve Bass, Paul Steele, Camilla Toulmin, Oliver Greenfield, Chris Hopkins, Inhee Chung, and Thomas Nielsen, 2016.
4. Green Energy Development, Dereje Senshaw, 2017.
5. NDC Implementation Roadmap Development: Guidelines for Small Island Developing States, Douglas Marett, Marc André Marr, Katerina Syngellakis, and Kristin Deason, 2018.
6. GGGI Strategic Outcomes Guideline: Frameworks and Methodologies for Development Impact Estimation, Pranab Baruah, Frank Rijsberman, and Diana Quezada, 2019.
7. Mitigation Outcome Purchase Agreements, Ximena Aristizabal, Carlos Maldonado, 2023

Copyright © 2023

Global Green Growth Institute
Jeongdong Building 19F
21-15 Jeongdong-gil
Jung-gu, Seoul 04518
Republic of Korea

Disclaimer: The Global Green Growth Institute does not make any warranty, either express or implied; or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed of the information contained herein; or represents that its use by any third party would not infringe privately owned rights. The views and opinions of the authors expressed herein do not necessarily state or reflect those of the Global Green Growth Institute.

ACKNOWLEDGEMENTS

The GGGI prepared this report as part of the organization's efforts to develop guides, tools and methods to support countries' to enhance and develop their Climate Action Plans and Strategies.

Oversight: Stelios Grafakos and Basil Oberholzer.

Lead authors: Stelios Grafakos, Basil Oberholzer, Shivenes Shammugam and Diana Quezada.

Additional support, editing and visuals: Julia Gross (adelphi consult GmbH) and Daria Ivleva (adelphi consult GmbH).

GGGI Reviewers and contributors: Camilo Ortega, Carlos Matias Figueroa, David Munka, Elena Castellano, Katelyn Jison Yoo, Katherine Ovalle, Kurnya Roesad, Malle Fofana, Marshall Brown, Miguel Londono, Nadia Laribi, Sohna Ngum, Tengjiao Wang, Yoo Lim Jeon, Wesley Ramnauth.

External reviewers: Adam Ward (IEA), Adrien Vogt (AFD/ IADB), Agung Adhiasto (UNFCCC), Andrea Bassi (KnowlEdge), Henri Weisman (IDDRI), Johanna J. Zilliacus (ADB consultant), Iris van der Lugt (IRENA), Kenichi Kitamura (UNFCCC), Oscar Fuertes Zarzo (GIZ), Rasmane Zongo (Ministry of Economy, Finance and Development of Burkina Faso), Toyo Kawabata (IRENA), Vivien Foster (Climate Compatible Growth/ Imperial College London).

Design and graphics: Formato Verde.

Please cite as: Grafakos, S., Oberholzer, B., Shammugam, S., and Quezada, D., (2025). Integrating Economic and Financial Issues into National Climate Plans and Strategies: A Guide for Policymakers. GGGI Technical Report No. 41. Global Green Growth Institute, Seoul, Republic of Korea.

ACRONYMS AND ABBREVIATIONS

AFOLU	Agriculture, Forestry, and Other Land Use
BAU	Business-As-Usual
CBA	Cost-Benefit Analysis
CBIT	Capacity-Building Initiative for Transparency
CMA	Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement
CRGE	Climate Resilient Green Economy
ESG	Environmental, Social, and Governance
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEM	Green Economy Model
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GST	Global Stocktake
IOA	Input-Output Analysis
IPCC	Intergovernmental Panel on Climate Change
L&D	Loss and Damage
LDC	Least Developed Country
LEAP	Long-range Energy Alternatives Planning
LT-LEDS	Long-Term Low-Emission Development Strategies
MACC	Marginal Abatement Cost Curve
MRV	Measurement, Reporting, and Verification
NGFS	Network for Greening the Financial System
NDC	Nationally Determined Contribution
PDNA	Post-Disaster Needs Assessment
SAM	Social Accounting Matrix
SDG	Sustainable Development Goal
SIDS	Small Island Developing States
UNFCCC	United Nations Framework Convention on Climate Change

CONTENTS

1 Introduction: The Importance of Economic and Financial Analysis for Climate Action — 03

2 Integrating Economic and Financial Aspects into the National Climate Action Planning Process — 07

3 Stages and steps for aligning climate planning with macroeconomic and financial considerations — 11

4 Concluding remarks — 29

5 Additional Sources — 30

Appendices — 32

EXECUTIVE SUMMARY

This guide provides a comprehensive framework for integrating macroeconomic and financial considerations throughout the cycle of national climate policy planning and implementation, which the countries may adapt to their own contexts and planning processes. The guide offers a holistic, practical, step-by-step approach, specifically focusing on three pillars of climate action - mitigation, adaptation, and loss-and-damage (L&D). It is particularly useful for the development and implementation of climate policy documents, such as Nationally Determined Contributions (NDCs), Long-Term Low-Emission Development Strategies (LT-LEDS), and broader green growth strategies, as well as for aligning existing plans and strategic objectives with robust financial planning.

Objectives

The guide provides policymakers and experts with practical steps to develop climate policy documents with embedded macroeconomic and financial considerations, as well as to align existing plans with strategic financial planning. It also equips the Ministries of Finance and Climate Finance Units with guidance on integrating climate considerations into economic and financial planning and preparing financing strategies. It offers stepwise guidance, practical country examples, and analytical tools for macroeconomic and financial analysis, serving as a useful resource for officials at all stages of climate planning and implementation, from strategy development to financing.

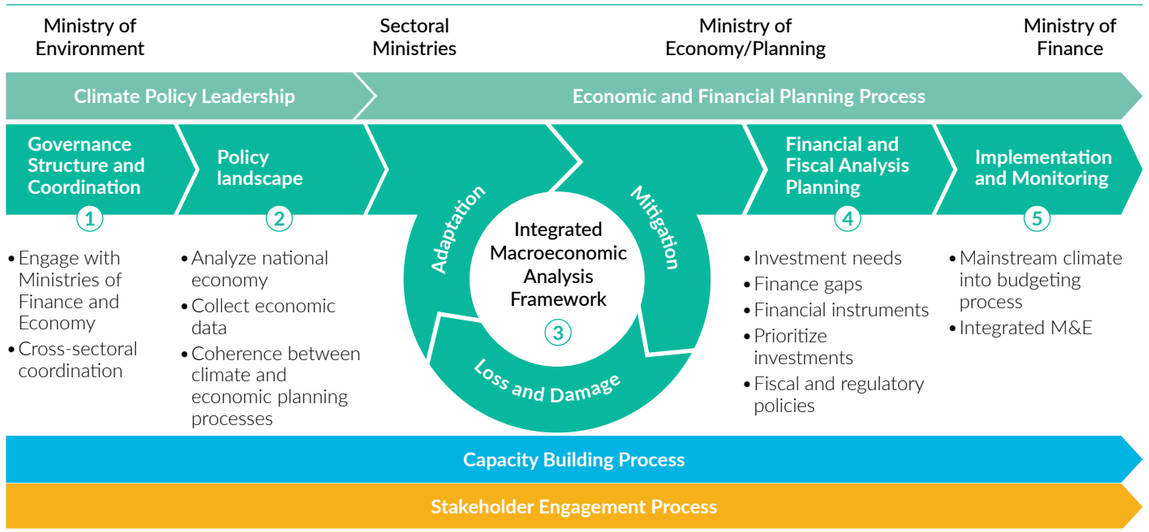
Target audience

This guide is designed for government officials from Ministries of Environment/Climate Change, Finance, and Economic Planning; sectoral experts from key ministries and members of inter-ministerial steering committees; technical experts conducting macroeconomic modelling and climate finance assessments, as well as development and implementation partners.

Step-by-step guide for integrating macroeconomic and financial aspects

The guide presents a structured approach organized into five stages (see **Figure 1**). Depending on countries' resources, capacities, and needs, governments may prioritize the most relevant and feasible elements. The guide provides countries with flexible methodologies and tools that can be adapted to national circumstances. By following this approach, policymakers can develop climate plans that are not only ambitious with respect to climate goals but also economically viable. These plans can promote long-term economic development, minimize financial risks, and maximize co-benefits for sustainable and inclusive growth. Each stage includes several actions, with further guidance on how to implement them. The following sequence of stages provides an overview of these actions.

Figure 1 Integration of economic and financial issues into climate planning and implementation



Source: Developed by authors.

STAGE 1: Governance Structure and Coordination

- Engage the Ministries of Economy and Finance actively in climate policy
- Establish effective and coherent cross-sectoral coordination and governance

STAGE 2: Current Policy Landscape, Priorities, and Context

- Analyze the national economy and policy context
- Collect the most recent economic data, identify risks, select analytical tools
- Ensure coherence between national climate and economic development planning and policy processes

STAGE 3: Integrated Macroeconomic Analysis Framework - Mitigation, Adaptation, Loss & Damage

- Assess macroeconomic effects of climate interventions and scenarios
- Conduct expert consultations to refine outcomes of macroeconomic analysis

STAGE 3.1: Mitigation

- Identify socioeconomic benefits and effects of mitigation measures
- Assess investment requirements for mitigation measures
- Quantify and monetize costs and benefits of mitigation measures
- Analyze costs and benefits against gender equality, social inclusion, and just transition
- Assess employment effects of mitigation measures
- Assess the effects of mitigation measures on human capital, education systems and other aspects of labor market
- Integrate employment assessments and targets into climate plans and strategies
- Quantify effects of mitigation measures on trade and balance of payments

STAGE 3.2: Adaptation

- Assess how adaptation measures reduce economic loss and damage
- Estimate the costs and investment requirements for adaptation measures
- Assess the impacts of adaptation measures on human capital and labor markets
- Identify and assess synergies and co-benefits between mitigation and adaptation
- Analyze costs and benefits from gender equality and social inclusion perspective

STAGE 3.3: Loss & Damage (L&D)

- Quantify climate-sensitive economic risks, L&D
- Quantify financial implications of climate-induced L&D
- Identify and prioritize interventions to avert, minimize, and address economic L&D

STAGE 4: Finance

- Estimate financial resources required to implement planned climate action
- Estimate current finance flows for climate actions
- Plan financing low-carbon investment in line with sustainable debt, price stability and considerations of the cost of capital
- Assess the climate finance gap and climate finance environment
- Identify and prioritize finance sources that could be leveraged to close the gap (i.e. private/blended)
- Use quantified co-benefits to prioritize investments in key economic sectors
- Analyze the use of fiscal and regulatory policies to provide incentives to economic actors and generate revenues to implement climate action

STAGE 5: Implementation and Monitoring

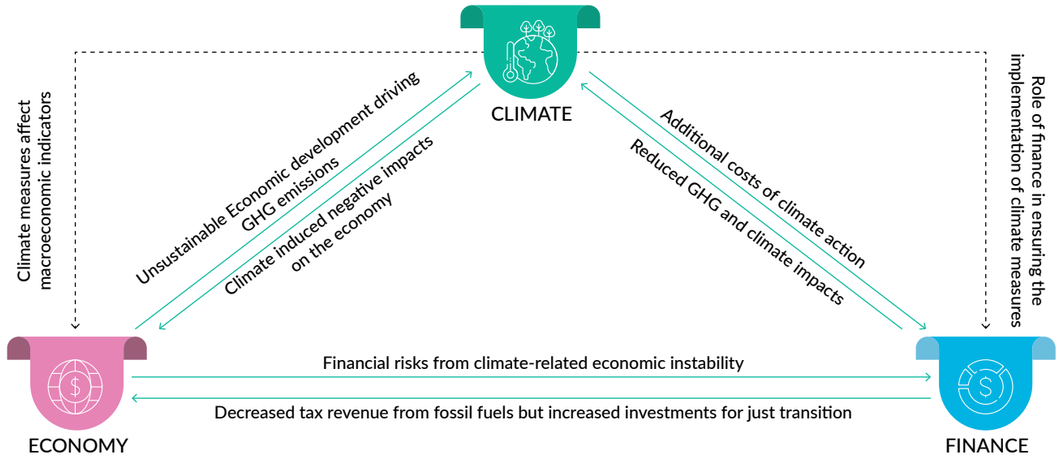
- Allocate resources required to implement climate action
- Integrate climate (e.g. NDC/LT-LEDS) finance plan into macroeconomic framework
- Integrate climate strategies and plans into the country's budgeting processes
- Allow climate plan implementation to adapt to evolving economic circumstances
- Develop integrated climate and economic development monitoring and evaluation

Introduction: The Importance of Economic and Financial Analysis for Climate Action

Background

National climate planning is an ongoing, cyclical process in which countries regularly develop, implement and review strategies to address climate change. This includes not only periodic enhancement of Nationally Determined Contributions (NDCs) but also the development and revision of Long-Term Low-Emission Development Strategies (LT-LEDS) and other frameworks aligned with the Paris Agreement, like National Adaptation Plans (NAPs). National climate plans must integrate lessons learned from previous planning and implementation cycles to reflect the highest possible ambition in target setting and ensure coherence between climate objectives and economic development goals. Economic activities that drive prosperity often produce greenhouse gas (GHG) emissions, especially when dependent on fossil fuels or unsustainable land use. Climate impacts, in turn, can undermine economic development, while mitigation and adaptation measures – though they require investment – can reduce climate-related losses and offer economic benefits. The interplay between climate action, macroeconomic indicators, and finance is dynamic: economic conditions influence the capacity to invest in climate solutions and implement them, and strategic climate investments can strengthen economic resilience and sustainability. **Figure 2** illustrates interrelationships between climate, macro-economy, and finance.

Figure 2 Simplified interrelationships between climate, macro-economy and finance



Source: Developed by authors.

According to the UNFCCC's 1st Global Stocktake (GST)[1], Parties are encouraged to develop and apply methodologies and tools, including modeling tools, to assess and analyze the impacts of implementing climate change response measures, with a view to minimizing negative impacts and maximizing positive ones, to strengthen capacity-building, and promote sustainable development. The GST emphasizes the role of economic diversification and systemic transformation in addressing climate challenges. Urgent mitigation action – e.g. adopting renewables and improving energy efficiency – is not only cost-effective, but it also drives socioeconomic and development benefits like improved health, education, job creation, and poverty reduction. Assessing these benefits provides critical insights for prioritizing certain climate actions and pathways over inaction or delay. However, rapid transitions must be carefully managed to maximize socioeconomic gains and minimize disruption, while bridging information gaps is vital for unlocking the full benefits of climate action. The GST also highlights the urgent need to address financial barriers, especially for developing countries, by accelerating climate finance mobilization, improving access to finance, reforming financial systems, and fostering international collaboration. **Integrating macroeconomic and financial analysis into climate policy processes such as NDC or LT-LEDS development and implementation is thus essential to inform policy decisions, and a practical guide on incorporating these considerations is urgently needed.**

Unique Features of the Guide

The key distinction of this guide is its holistic, practical, step-by-step approach to integrating macroeconomic and financial considerations across the entire cycle of national climate policy planning and implementation, with a specific focus on mitigation, adaptation, and loss-and-damage (L&D) pillars. While some publications and tools highlight individual elements – such as enhancing NDCs (NDC Partnership navigator, UNDP checklist), NDC investment planning (NDC Partnership, NDC Partnership/GCF), adaptation in NDCs (NDC Partnership), L&D in NDCs (WWF), health in NDCs (WHO), developing LT-LEDS (UNDP, AGNES, 2050 Pathways Platform, GIZ/NewClimate Institute, EU4Climate, GIZ), or aligning NDCs and LT-LEDS (IDDRI/2050 Pathways Platform, GGGI/GIZ) – and others address economic and financial aspects in climate policy (ADB, GIZ, Coalition of Finance Ministers, ECCO, NGFS), they rarely provide concrete, actionable steps and do not address all three climate policy pillars together.

Many policymakers still lack clear starting points, stepwise guidance, or the tools and capacity needed – exacerbated by data gaps, weak coordination with finance ministries, and limited use of fiscal instruments. **To date, there is no other guide specifically for supporting governments in integrating macroeconomic and finance issues across climate policy planning and implementation.** Unlike the NDC Partnership brief (focused on NDC investment), or the 2050 Pathways Platform guidance (focused on LT-LEDS), this guide addresses macroeconomic and financial aspects holistically, not highlighting one specific climate policy document. Compared to the NDC Partnership/GCF's Climate Investment Planning and Mobilization Framework, this guide is broader in scope, addressing policy coherence and covering mitigation, adaptation and L&D.

1 UNFCCC (2023). Decision 1/CMA.5: Outcome of the first global stocktake. https://unfccc.int/sites/default/files/resource/cma5_auv_4_gst.pdf

The Guide's Objectives and Target Audience

The Guide offers stepwise guidance, practical country examples, and analytical tools for macroeconomic and financial analysis, serving as a useful resource for officials at all stages of climate planning and implementation, from strategy development to financing. It provides policymakers and experts responsible for climate policy development and implementation with practical steps to embed macroeconomic and financial considerations into climate documents such as NDCs, LT-LEDS or broader green growth strategies, while also equipping the Ministries of Finance and Climate Finance Units with guidance on integrating climate considerations into economic and financial planning and preparing financing strategies. The guide is particularly relevant for enhancing coordination between environment/green economy and finance ministries, identifying entry points for the latter, informing donors and technical assistance providers and raising awareness about macroeconomic and financial analysis, focusing on selected tools and models. As it addresses national climate planning processes covering both mitigation and adaptation, it does not directly focus on the National Adaptation Plans (NAPs), though some of its methods and tools can inform the NAP process.

Figure 3 summarizes the main characteristics of key national climate planning processes and the potential roles of the Ministries of Environment and the Ministries of Finance, Economy/Planning and Development in these processes.

Figure 3 National climate plans and strategies[2]

NDCs	LT-LEDS	NAPs	Green Growth Strategies
✓ Paris Agreement	✓ Paris Agreement	✓ Paris Agreement	⊗ Paris Agreement
Coverage: All Parties **Binding:** Mandatory **195 submissions**	**Coverage:** All Parties **Binding:** Voluntary **80 submissions**	**Coverage:** All Parties **Binding:** Voluntary **75 submissions**	**Coverage:** Any Country **Binding:** Voluntary ***Not applicable***
Time horizon: Short-medium **Updates:** Every 5 years **Coverage:** ● Mitigation ● Adaption ● Loss & Damage ● Finance	**Time horizon:** Mid-century or longer **Updates:** Voluntary **Coverage:** ● Mitigation ● Adaption ○ Loss & Damage ◖ Finance	**Time horizon:** Short to mid-century **Updates:** Voluntary **Coverage:** ○ Mitigation ● Adaption ○ Loss & Damage ● Finance	**Time horizon:** Short to mid-century **Updates:** Voluntary **Coverage:** ● Mitigation ◖ Adaption ○ Loss & Damage ◖ Finance
Ministry of Finance: Assessing needs, developing financing strategy	**Ministry of Finance:** Fiscal incentives for transformation, leveraging finance	**Ministry of Finance:** Assessing needs, financing strategy, disaster risk finance	**Ministry of Finance:** Fiscal incentives for transformation, catalysing capital

Ministry of Environment: Leads the development and implementation of these strategies in close collaboration with Economy/Finance Ministries.
Ministry of Economic Planning/Finance: Integrates these strategies into country goals, economic and investment strategies, coordinates finance/ implementation across sectors, monitors climate finance and aligns implementation with budget cycle.

SCOPE: Sectoral & Economy-wide

Source: Developed by authors.

2 Number of submissions as of December 2025. The figure does not represent an exhaustive overview of climate policy plans and strategies. Other national climate policy processes include, for example, the development of Biennial Transparency Reports (BTRs), National Climate Change Strategies, sectoral decarbonization roadmaps, carbon pricing frameworks, climate finance strategies, Just Transition plans, National Biodiversity Strategies, etc. They were not included in the figure as they may vary significantly depending on the country context and/or are less relevant for the purpose of this guide.

Guiding Principles

There is no one-size-fits-all approach to national climate planning (i.e., NDCs, LT-LEDS, NAPs, Green Growth Strategies), due to each country's unique context, but some overarching principles apply. **Box 1** below summarizes these principles, adapted from UNFCCC,[3] NDC Partnership,[4] and GGGI[5] guidance. These principles reflect the integration of macroeconomic and financial aspects into national climate planning.

Structure of the Guide

Chapter 2 outlines the main stages and activities of the national climate action planning process, highlighting key entry points for integrating macroeconomic and financial considerations. Chapter 3 provides country examples and methods to incorporate macroeconomic and financial analysis into each stage of the national climate action planning process. Finally, Chapter 4 presents the guide's key conclusions. The Annexes provide more detailed information on the analytical tools mentioned in Chapter 3, outlining the requirements and considerations for implementing the tools.

BOX 1 Overarching principles for aligning climate plans and strategies with macroeconomic and financial considerations

Country-driven process: Ensure that macroeconomic and financial integration reflects national priorities for true country ownership, and mainstream climate issues into all development planning and policy processes. Establish appropriate institutions from the outset.

Flexible and context-specific approaches: Tailor financial strategies and macroeconomic analysis to each country's circumstances and avoid duplications.

Evidence-based decision-making: Use robust, context-specific economic and financial data and methods to assess climate actions' costs, benefits, trade-offs, and co-benefits, and transparent, multidisciplinary processes to select the tools.

Strengthening existing efforts: Build on existing institutional arrangements, economic assessments and finance mobilisation efforts, especially in Least Developed Countries (LDCs) and Small Island Development States (SIDS).

Climate-informed economic planning: Embed climate considerations into economic strategies, budgets, and financial systems, and ensure that macroeconomic and financial analysis inform climate policies.

Cross-sectoral coordination: Ensure coherent, synergistic climate action across sectors and climate policy domains (e.g. mitigation and adaptation) by e.g. establishing technical working groups.

Equity and inclusivity: Promote equitable distribution of benefits, social inclusion, gender equality, just transitions and support for vulnerable populations in financial strategies and economic planning for climate policy implementation.

Knowledge-sharing and capacity-building: Foster cross-country collaboration to share best practices in financing climate action building institutional capacities for economic analysis to support South–South cooperation.

Iterative review and revision: Refine economic and financial aspects of national climate policy documents periodically based on new data.

3 LT-LEDS Synthesis report, UNFCCC, 2023. https://unfccc.int/sites/default/files/resource/cma2023_10.pdf

4 NDC Navigator. https://ndcnavigator.org/

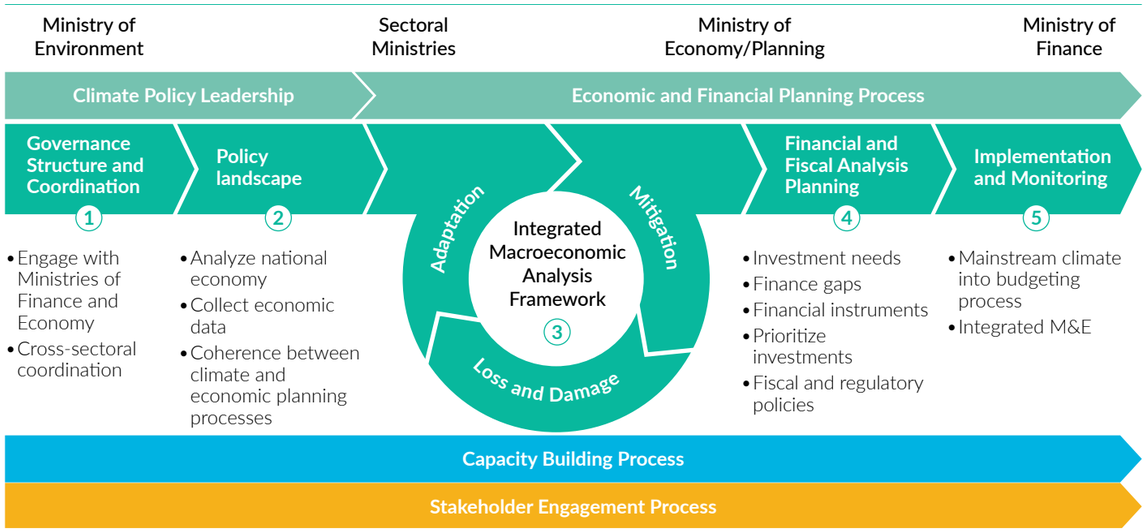
5 Accelerating Transformative Climate Action through Long Term – Low Emission and Climate Resilient Development Strategies, GGGI, 2023. https://gggi.org/wp-content/uploads/2024/02/GGGI_Insight_Brief_8.pdf

2

Integrating Economic and Financial Aspects into the National Climate Action Planning Process

Integrating economic and financial aspects into the National Climate Action Planning Process helps countries adopt a more systemic approach to low-carbon and climate-resilient development, considering the full range of costs and benefits and prioritising investments based on societal performance and their contribution to sustainable development. Low-carbon and climate-resilient development strategies and plans should be embedded in overall national economic development planning. **Figure 4** illustrates useful entry points for engaging the Ministries of Economy and Finance in the National Climate Action Planning Process and highlights economic and financial aspects that need to be integrated throughout this process.

Figure 4 Interministerial coordination and Integration of macroeconomic and financial issues into climate planning and implementation



Source: Developed by authors.

Table 1 shows the stages (column 1) and steps (column 2) of the National Climate Action Planning Process. Columns 1 and 2 are based on relevant guides on NDC and LT-LEDS (UNFCCC report, UNDP checklist, UNDP LT-LEDS). Column 3 lists key questions to identify entry points for integrating macroeconomic and financial issues at each stage of the National Climate Action Planning Process. Each of these questions is addressed in more detail in Chapter 3 of the guide. The proposed stages and steps can be pursued in parallel rather than follow a rigid sequence. Depending on countries' resources, capacities, and needs, governments may prioritize and address the entry points that are most relevant and feasible. The table is also included in the annex as a practical checklist for policymakers and practitioners (see **Table 4** in the **Annex I**).

Table 1 Steps to integrate macroeconomic and finance issues into national climate planning and implementation

STAGES OF THE NATIONAL CLIMATE ACTION PLANNING PROCESS	STEPS TO INTEGRATE MACROECONOMIC AND FINANCE ISSUES INTO THE CLIMATE ACTION PLANNING PROCESS	ENTRY POINTS TO INCORPORATE ECONOMIC AND FINANCIAL ASPECTS
Stage 1 Governance Structure and Coordination	**1.1 Engage the Ministries of Economy and Finance in climate policy processes**	Are the Ministries of Economy and Finance actively involved in the development of national climate plans and strategies?
	1.2 Establish effective and coherent cross-sectoral coordination and governance	Have cross-sectoral coordination mechanisms and governance structures been established to ensure economic considerations are integrated into climate planning?
	1.3 Ensure coherence between national climate and economic development planning and policy processes	Have economic and financial aspects been integrated into sectoral climate planning, and have climate indicators been included in national economic development strategies? Does the country ensure coherence between national climate change strategies and economic development plans to promote green growth and effective climate action?
Stage 2 Current Policy Landscape, Priorities, and Context	**2.1 Analyze the national economy and policy context**	Has the national economy and policy context been analyzed to consider how existing economic, climate, and environmental policies enable or hinder climate action?
	2.2 Collect the most recent economic data, identify risks and select analytical tools	Has economic data been collected to identify past climate-induced losses and damages and potential climate-induced risks and inform the choice of analytical tools for climate planning?
Stage 3 Integrated Macroeconomic Analysis Framework - Mitigation, Adaptation, L&D	**3.1 Assess macroeconomic effects of climate interventions and scenarios**	Have you assessed the macroeconomic impacts of climate interventions on GDP, employment and fiscal stability? Is your country conducting detailed macroeconomic assessments of climate interventions beyond conventional modeling approaches?
	3.2 Conduct expert consultations to refine outcomes of macroeconomic analysis	Do the assumptions, data inputs, and modeled outcomes of macroeconomic analyses reflect real-world economic conditions and sector-specific realities as best as possible or need to be refined?
Stage 3.1 Mitigation	**3.1.1 Identify socioeconomic benefits and effects of mitigation measures**	Have socioeconomic benefits and potential adverse effects of mitigation measures been identified?
	3.1.2 Assess the investment requirements for mitigation measures	Have the investment needs for mitigation measures been assessed to prioritize actions based on available resources?
	3.1.3 Quantify and monetize costs and benefits of mitigation measures	Have costs and benefits of mitigation measures been assessed to inform prioritization?
	3.1.4 Analyze costs and benefits against gender equality, social inclusion, and just transition	Have you assessed the distribution of costs and benefits of climate actions from gender equality, social inclusion, and just transition perspectives?
	3.1.5 Assess employment effects of mitigation measures	Have the employment effects of mitigation measures, e.g. job creation and loss, been assessed?
	3.1.6 Assess the effects of mitigation measures on human capital (e.g., skills requirements), education systems, and other aspects of labor market)	Have the human capital needs of mitigation measures, including skills needs, and the potential of education systems to address those needs, been analyzed?
	3.1.7 Integrate employment assessments and targets into climate plans and strategies	Have employment assessments and targets been integrated into climate plans?
	3.1.8 Quantify the effects of mitigation measures on trade and balance of payments	Have the effects of mitigation measures on trade and the balance of payments been assessed?
Stage 3.2 Adaptation	**3.2.1 Assess how adaptation measures reduce economic losses and damages**	Have the reduced economic losses and damages from adaptation measures been assessed?
	3.2.2 Estimate the costs and investment requirements for adaptation measures	Have the costs of adaptation measures been estimated using relevant cost data?
	3.2.3 Assess the impacts of adaptation measures on human capital and labor markets	Has the effect of adaptation measures on employment opportunities been assessed?
	3.2.4 Identify and assess synergies and co-benefits between mitigation and adaptation	Have the synergies and co-benefits between mitigation and adaptation action been assessed?
	3.2.5 Analyze costs and benefits from gender equality and social inclusion perspective	Have costs and benefits of adaptation measures been analyzed, considering gender equality and social inclusion aspects?

Stage 3.3 Loss and Damage	**3.3.1 Quantify climate-sensitive economic risks, losses, and damages**	Does the assessment quantify climate-related economic risks, losses, and damages, considering both modeling and non-modeling approaches?
	3.3.2 Quantify financial implications of climate-induced losses and damages	Does the assessment quantify climate-induced financial losses?
	3.3.3 Identify and prioritize interventions to avert, minimize, and address economic L&D	Have the actions to improve governance, secure international funding, and address economic losses while aligning with local and global goals been prioritized?
Stage 4 Finance	**4.1 Estimate financial resources required to implement planned climate action**	Does the climate plan or strategy estimate the financial resources required to implement planned mitigation and adaptation actions?
	4.2 Estimate current finance flows for climate actions	Does the estimation of current finance flows for climate action identify and differentiate sources (public/private/blended, domestic vs. international), types, and sectors?
	4.3 Plan financing low-carbon investment in line with sustainable debt, price stability, and considerations of the cost of capital	Does the financing plan for low-carbon investment align with sustainable debt and price stability?
	4.4 Assess the climate finance gap and climate finance environment	Has the climate finance gap been assessed, and climate finance environment evaluated?
	4.5 Identify (climate) finance sources that could be leveraged to close the gap	Did you identify potential finance sources to close the finance gap?
	4.6 Use quantified co-benefits to prioritize investments in key economic sectors	Does the climate plan or strategy prioritize investments based on quantified co-benefits and financial returns?
	4.7 Analyze the use of fiscal and regulatory policies to provide incentives to economic actors and generate revenues to implement climate action	Has the use of fiscal and regulatory policies to incentivize green investments and generate revenues for climate action been assessed?
Stage 5 Implementation and Monitoring	**5.1 Allocate resources required to implement climate action**	Have financial and technical resources been allocated to implement climate plans and strategies?
	5.2 Integrate climate (e.g. NDC/ LT-LEDS) finance plan into macroeconomic framework	Has the climate finance plan been integrated into the country's macroeconomic framework, considering its economic effects on fiscal and monetary policies?
	5.3 Integrate climate strategies and plans into the country's budgeting process	Have climate plans and strategies been integrated into the country's budgeting process?
	5.4 Allow climate plan implementation to adapt to evolving economic circumstances	Is climate plan implementation flexible enough to respond to changing economic circumstances, such as shifting funds or timelines due to unforeseen events?
	5.5 Develop integrated climate and economic development monitoring and evaluation	Is an integrated climate and economic development monitoring and evaluation system in place to track climate investments?

Source: Developed by authors.

3

Stages and steps for aligning climate planning with macroeconomic and financial considerations

STAGE 1: GOVERNANCE STRUCTURE AND COORDINATION

1.1 Engage the Ministries of Economy and Finance in climate policy processes

Are the Ministries of Economy and Finance actively involved in the development of national climate plans and strategies?

While the Ministry of Environment or Climate Change often leads climate policy, engaging the Ministries of Economic Planning and Finance is crucial to align climate action with national economic and financial strategies and ensure that climate measures are cost-effective, economically feasible, and support national development while minimizing financial risks. The Ministry of Finance can facilitate mobilizing adequate resources for NDC and LT-LEDS implementation. It can oversee or lead the design of financial instruments, such as blended finance, climate finance, green bonds, carbon pricing mechanisms, etc. The formal endorsement of climate plans and strategies by the Ministries of Finance and Economic Planning is a strong signal of national-level commitment to address climate issues across the economy, and the work with other line Ministries on appropriate financing instruments to implement prioritized sectoral climate interventions. In many countries, the mandates of Ministries of Finance and Economy are evolving, reflecting their increasing involvement in climate action.

1.2 Establish effective and coherent cross-sectoral coordination and governance

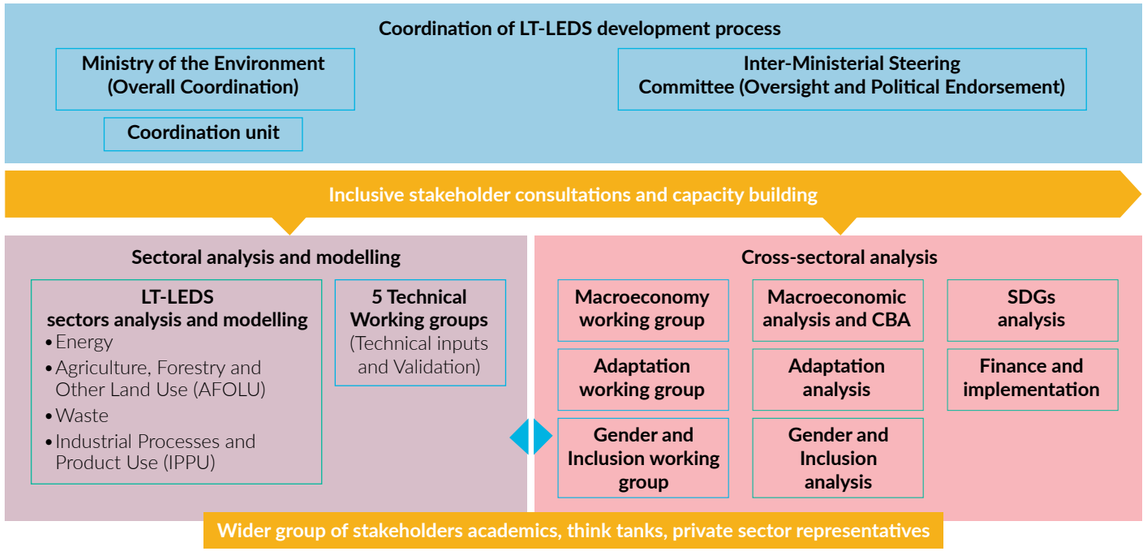
Have cross-sectoral coordination mechanisms and governance structures been established to ensure economic considerations are integrated into climate planning?

Cross-sectoral coordination is essential for addressing climate change's macroeconomic and financial implications, particularly in priority sectors such as energy, transport, agriculture, forestry, industry, urban development, and water. Coordination helps identify economic co-benefits, avoid unintended financial risks, and align NDCs/LT-LEDS with existing sectoral programs and priorities. Understanding, establishing, or strengthening existing coordination mechanisms can advance the whole-of-government approach and ensure a balanced integration of climate ambition and economic development priorities. Many countries have established inter-ministerial steering committees to develop NDCs. The Ministry of Finance and/or the Ministry of Economic Planning should be part of these Committees and actively engage in or lead the development of the NDC/LT-LEDS finance plans. Sectoral and cross-sectoral economy-wide working groups ensure policy coordination as well as include more experts in the development of socioeconomic and emission pathways. Apart from government representatives, such working groups could involve private sector actors for conducting financing assessments, civil society actors for social inclusion/just transition analysis, academia for conducting macroeconomic analysis as well as development partners for planning external financial support.

BOX 2 Example: Burkina Faso's LT-LEDS cross-sectoral coordination

The LT-LEDS development process in Burkina Faso embedded all steps within national institutions. Sectoral technical working groups developed and analyzed business-as-usual (BAU) and low-emission development scenarios for agriculture, forestry, and other land use (AFOLU), waste, energy, transport, and industrial processes and product use (IPPU). The groups included national sectoral experts with previous experience in NDC revision, GGGI experts from different units, and international experts on system dynamics modeling. National experts ensured data collection, consultations, and validation with sector experts from key ministries and other public and private sector stakeholders. The working groups prioritized climate actions for inclusion in the final sectoral and economy-wide scenarios. In addition, gender focal points in climate-related ministries reviewed all sectoral climate interventions from a gender and social inclusion perspective. A focal point from the Ministry of Finance, Economy, and Development participated in the work systematically. Identifying and mobilizing committed and capable experts by and within different government units was a critical success factor.

Figure 5 Coordination structure of Burkina Faso LT-LEDS, 2024



Capacity building and appropriate resource allocation are essential for effective collaboration across sectors when developing climate plans and strategies. Preparatory activities and knowledge exchange to assess the readiness, capacity, and budget needs of the units involved in conducting macroeconomic/fiscal analysis during the planning process should happen early on. Countries with various levels of capacities can approach the topic differently: for instance, the analysis may range from a minimum approach when resources and capacities are limited to more elaborate methods when greater resources are available (see **Tool 1** in **Annex III**). Different roadmaps or blueprints can be developed for conducting this analysis, depending on the country's capacities.

1.3 Integrate economics into climate planning, and climate aspects into economic development planning

Have economic and financial aspects been integrated into sectoral climate planning, and have climate indicators been included in national economic development strategies? Does the country ensure coherence between national climate change strategies and economic development plans to promote green growth and effective climate action?

The analysis of the selected sectors needs to integrate economic and financial aspects well. Sectoral emission reduction and resilience scenarios are required to enhance the cost-effectiveness and economic opportunities of climate action. At the same time, economic assessment of the multiple socioeconomic benefits of climate action, including those that do not result in cash flows, allows governments to better justify, prioritize, and mobilize finance. Similarly, integrating climate considerations in national economic planning, programming, and budgeting promotes effective climate action. By embedding these priorities, national climate plans become more practical and implementable, foster greater buy-in on the part of stakeholders and different Ministries, including the Ministry of Finance/Economic Planning, and make climate objectives consistent with the country's economic development goals.

Economic policies and priorities related to industrial and infrastructure development, creating green jobs, securing the energy supply, alleviating poverty, and Sustainable Development Goals (SDGs) can serve as a foundation for climate plans and strategies that promote green and inclusive economic growth.

BOX 3 Example: Ethiopia's LT-LEDS target-setting

During Ethiopia's LT-LEDS process, the economic development targets of the country's 10-year development plan were incorporated into LT-LEDS' alternative net zero emission pathways, ensuring full consistency between long-term climate objectives, medium-term economic targets, and the country's aspirations.

STAGE 2: CURRENT POLICY LANDSCAPE, PRIORITIES AND CONTEXT

2.1 Analyze the national economy and policy context

Has the national economy and policy context been analyzed to consider how existing economic, climate, and environmental policies enable or hinder climate action?

It is important to describe the macroeconomic context when developing a climate policy document (e.g. NDC or LT-LEDS). Sufficient analysis of the links between existing climate policies and economic development policies and plans is essential (the depth of the analysis depends on the capacities, see **Figure 6** below and **Box 20** in **Annex II**). How existing policies can be a barrier (or enabler) to future climate action should be part of this. In many cases, regulations and policies are built around old (mitigation or adaptation) technologies and become a barrier to new climate policies and measures.[6]

2.2 Collect the most recent economic data, identify risks and select analytical tools

Has economic data been collected to identify past climate-induced L&D and potential climate-induced risks and inform the choice of analytical tools for climate planning?

Economic data – such as GDP and GDP growth, unemployment rate, trade balance, national debt, current climate financial flows, and the use of financing instruments and mechanisms – should be an integral part of data collection and review in climate planning. It is also important to collect information on economic damages and losses incurred because of climate-induced disasters. Government experts from the Ministry of Finance/Economic Planning should also identify potential low-carbon transition and climate-induced financial risks.

Identifying data and knowledge gaps is a key to determining the type of economic analysis that will be conducted and the models/tools to use. This should be consistent with the expertise and tools utilized already. More sophisticated tools with greater data and technical requirements, such as the Green Economy Model, may help build advanced technical expertise and capacity. However, simpler models such as Marginal Abatement Cost analysis tools may be more effective for countries with limited resources or where immediate results are a priority.

6 Fazekas, Andreas, Chris Bataille, and Adrien Vogt-Schilb. "Achieving Net-Zero Prosperity: How Governments Can Unlock 15 Essential Transformations." Inter-American Development Bank, 2022. https://publications.iadb.org/en/publications/english/viewer/Achieving-Net-Zero-Prosperity-How-Governments-Can-Unlock-15-Essential-Transformations.pdf

Figure 6 Tiered roadmap: integrating climate & economic planning for countries with different capacity levels

Tailored approaches based on country capacity, resources & data availability

CAPACITY PROGRESSION →	STAKEHOLDER COORDINATION	TECHNICAL ANALYSIS	MRV SYSTEM
TIER 1 Limited Capacity	Establish basic inter-ministerial coordination between Finance and Economy ministries. Leverage coordination to obtain reliable data and align priorities.	Prioritise minimal viable analysis. Use high-level tools: Marginal Abatement Cost Curves (MACCs), qualitative assessments, and stakeholder consultations.	Collect existing economic data and past climate loss records. Track basic co-benefits: job creation in renewables, reduced import bills from energy efficiency.
TIER 2 Moderate Capacity	Formalise structured engagement processes for systematic updates. Implement cross-sectoral working groups for detailed data collection and climate finance assessments.	Conduct systematic Cost-Benefit Analyses (CBA) for key interventions. Use Input-Output Analysis or Social Accounting Matrices for employment impacts; integrate climate damage functions.	Systematically link climate expenditures to outcomes. Track public & private financial flows; connect to macroeconomic indicators (sectoral GDP, employment rates).
TIER 3 High Capacity	Establish high-level inter-ministerial committees led by Finance & Environment ministries. Include central banks, private sector, and civil society to align climate with fiscal/monetary policy.	Employ advanced macroeconomic models (DSGE, CGE) for economy-wide assessment. Develop stock-flow consistent financial plans; conduct fiscal analyses for carbon pricing.	Develop integrated digital MRV platform tracking GHG reductions and socioeconomic indicators. Enable real-time policy adjustment; monitor green jobs, investment flows, fiscal revenues.

Countries can advance their analytical capacity over time, moving from basic to sophisticated approaches

Source: Developed by authors.

STAGE 3: INTEGRATED MACROECONOMIC ANALYSIS FRAMEWORK - MITIGATION, ADAPTATION, AND LOSS AND DAMAGE

3.1 Assess macroeconomic effects of climate interventions and scenarios

Have you assessed the macroeconomic impacts of climate interventions on GDP, employment, and fiscal stability? Is your country conducting detailed macroeconomic assessments of climate interventions beyond conventional modelling approaches?

Estimate macroeconomic impacts of mitigation and adaptation measures (e.g. in NDC updates and LT-LEDS), assessing effects on GDP growth, employment, investments, public revenues, trade balance, fiscal stability and balance of payments, enabling better informed decisions in national climate planning. Even when selecting and prioritizing climate interventions in different sectors as well as looking at mitigation and adaptation separately, an integrated and cross-sectoral analysis will be needed to understand how these interventions affect macroeconomic performance and GDP, capturing their various synergies.

There are various tools and models of macroeconomic analysis: Computable General Equilibrium (CGE) models, Dynamic Stochastic General Equilibrium (DSGE) models, Dynamic Input-Output models, or Social Accounting Matrices (SAM) and System-Dynamics models. Each approach has its advantages and disadvantages, and it is recommended to build on the methods the government is already using. For a more detailed review and assessment of the macroeconomic models and tools available, please consult UNEP (2014)[7] and NGFS (2024)[8]. The countries that GGGI supports favor the use of a customizable System Dynamics modeling framework such as the Green Economy Model (hereafter the GEM, see **Tool 1** in **Annex III**).[9]

The GEM provides a robust framework to evaluate economic implications of various mitigation and adaptation actions by simulating their interactions across sectors and quantifying their effects on GDP, employment, government revenue, and investment. This approach considers the dynamic feedback loops between economic activities, energy use, and emissions

7 https://www.un-page.org/static/2eb65e4ad79fdbecf183dff03d0bc9f7/2014-using-models-for-green-economy-policy-making-unep-models-ge-for-web.pdf

8 https://www.ngfs.net/sites/default/files/medias/documents/ngfs_climate-macroeconomic-modelling-handbook.pdf

9 https://www.wri.org/research/national-climate-action-green-economy-model-technical-note

reductions, offering a comprehensive perspective on economic effects of mitigation and adaptation, e.g.:

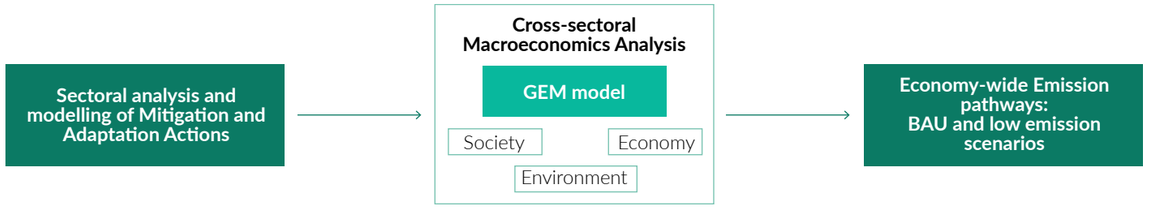
- Transitioning to renewable energy reduces reliance on fossil fuels, which leads to lower emissions and energy costs. Increased investment in renewables can increase new employment and offset potential job losses in fossil fuel sectors.
- In agriculture, adopting climate-smart practices reduces emissions, increases productivity and resilience to climate shocks and creates positive feedback loops for both the economy and emissions reductions.

In countries that intend to use Article 6 as part of implementing their NDCs and LT-LEDS, it is useful to assess the potential macroeconomic implications of cooperative approaches. Macroeconomic scenarios can, for example, reflect expected foreign direct investment and domestic private finance flows, analyze implications for the financial sector, and examine impacts on government revenues, the balance of payments and key indicators such as GDP and employment associated with Article 6 participation.

BOX 4 Example: application of the GEM in Ethiopia's LT-LEDS

Ethiopia used the GEM to integrate stakeholder inputs and generate scenarios for macroeconomic analysis of mitigation and adaptation actions for the LT-LEDS. Technical experts from relevant ministries and local agencies modelled emissions of sectoral mitigation and adaptation actions. The GEM combined these sectoral emissions with macroeconomic elements calibrated to the System of National Accounts. This allowed for a comprehensive assessment of economy-wide socioeconomic effects of mitigation actions. The GEM enabled cost-benefit assessments (CBA) and employment impact evaluations. In addition, it helped forecast the effects of mitigation and adaptation investments on GDP (see Figure 7).

Figure 7 Co-creation of different Ethiopia's LT-LEDS pathways through integrated macroeconomic modeling approach



Source: Developed by authors.

3.2 Conduct expert consultations to refine outcomes of macroeconomic analysis

Modeling modules added to conventional mitigation analysis tools often oversimplify economic and social dimensions, reducing their utility for informing real-world policy decisions. Rather than relying on modeling outputs alone, meaningful integration of macroeconomic and financial considerations requires detailed expert-led assessments that can refine and contextualize quantitative results within the broader climate strategy framework.

STAGE 3.1: MITIGATION

3.1.1 Identify socioeconomic benefits and adverse effects of mitigation measures

Have socioeconomic benefits and adverse effects of mitigation measures been identified?

Multiple socioeconomic benefits of climate action (see **Figure 8**) – in energy, transportation, agriculture, waste management, forestry, etc. – are well documented in scientific literature and by international organizations. Governments should identify and quantify these potential benefits to help drive implementation and inform the decision-making. It is equally important to identify potential adverse socioeconomic effects of climate action to develop measures to address or minimize them.

Figure 8 Type of benefits of climate action

Climate-related	Economic	Environmental	Social	Political & institutional
Reduce GHG emissions	Enhance energy security	Protect environmental resources	Enhance energy access	Contribute to political stability
Enhance resilience to climate change	Trigger private investment	Protect biodiversity	Reduce poverty incidence and inequality	Improve democratic quality of governance
	Improve economic performance	Support ecosystem services	Contribute to food and water security	Contribute to interregional collaboration
	Generate employment	Improve soil quality	Improve health	
	Stimulate technological change	Reduce air pollution	Reduce stressors (e.g., noise traffic congestion)	
	Contribute to fiscal sustainability			

Source: Mayrhofer & Gupta, 2016.

3.1.2 Assess investment requirements for mitigation measures

Have the investment needs for mitigation measures been assessed to prioritize actions based on available resources?

Assessing the climate interventions' investment requirements is the basis for any finance plan and strategy to move to implementation. Furthermore, correctly classifying conditional and unconditional actions is needed to develop and utilize new financial mechanisms, including opportunities for international carbon trading under Article 6.

The modeling of the low-carbon scenarios normally requires defining sectoral climate interventions, such as the number of hectares to be cultivated by sustainable agriculture, the number of megawatts of renewable energy capacity to be installed, the increase in energy efficiency, the number of ha to be afforested. To assess total investment requirements as well as the operation and maintenance costs one can use the data on the respective costs per units (per ha, per MW, etc.) The relation of these costs to the available financial resources helps assess the NDC's feasibility (while considering the country's fiscal context, sustainable finance readiness, risk level, etc.). Together with the financial and technical support required and the capacity to utilize innovative financial mechanisms, this assessment shows whether the country needs to prioritize certain interventions over others and helps determine the timeline as well as the conditional or unconditional climate actions.

3.1.3 Quantify and monetize costs and benefits of mitigation measures

Have costs and benefits of mitigation measures been assessed to inform prioritization?

Governments can inform their climate policies by comparing their costs and benefits[10] in a Cost-Benefit Analysis (CBA) framework (see **Tool 2** in **Annex III**). The benefits include cost savings (e.g., through energy efficiency), reduced adverse effects from climate-induced natural disasters (often expressed as the Social Cost of Carbon (SCC)), improved human health through better air quality, transport safety, and water quality, healthy soils and biodiversity. In addition, NDC implementation can generate significant macroeconomic benefits in terms of economic growth and employment.

10 Kalra, Nidhi, Edmundo Molina-Pérez, James Syme, Fernando Esteves, Hermilio Cortés, Mateo Tonatiuh Rodríguez-Cervantes, Víctor Manuel Espinoza-Juárez, et al. "The Benefits and Costs of Reaching Net Zero Emissions in Latin America and the Caribbean," December 7, 2023. https://doi.org/10.18235/0005330.

BOX 5 Example: CBA in Hungary's LT-LEDS

The CBA in Hungary for 2020-2050 shows that the benefits of green policy interventions exceed their costs. As jobs created are expressed in real terms rather than monetary terms, they are not directly comparable with other costs and benefits but still inform decision makers by showing the LT-LEDS's positive job effects.

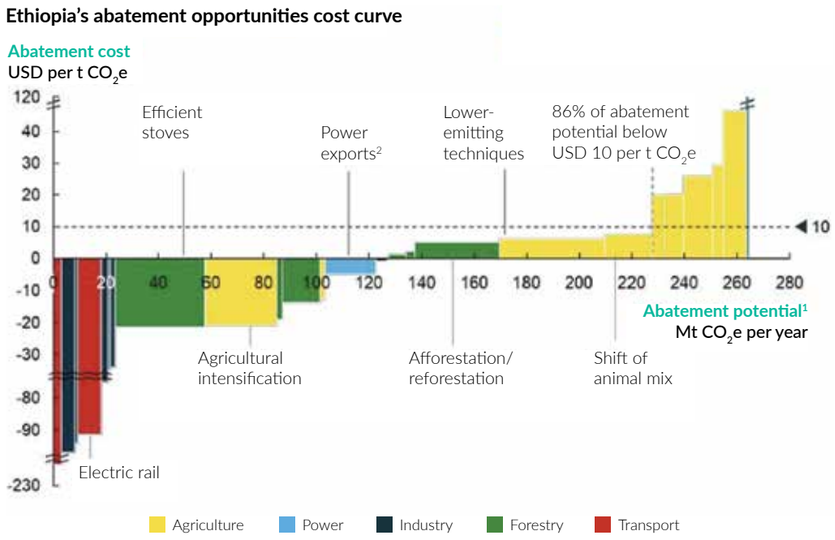
Table 2 LT-LEDS policy interventions' costs and benefits under the Early Action (EA) and Late Action (LA) scenarios in Hungary, 2020–2050

	EA SCENARIO 2020-2050	LA SCENARIO 2020-2050
Investment costs – billion HUF		
Agriculture	745	745
Waste management	480	476
IPPU	129	131
Energy	22 391	11 352
LULUCF	964	96 473
Total investment costs	24 709	13 668
Costs avoided - billion HUF		
Material	2 393	556
Energy cost avoided	2 142	305
Fertilizer cost avoided	251	251
Non material	4 993	3 441
Carbon's social cost avoided	2 604	2 269
Transport-related negative externalities	2 389	1 172
Total costs avoided	7 387	3 997
Added benefits – billion HUF		
Real GDP	19 783	11 170
Additional jobs created – number of jobs		
Total net new jobs	182 566	123 690
Indirect employment created	64 983	60 678
Direct employment created	117 583	63 012

Source: Government of Hungary, 2021.

Another method is the cost–effectiveness analysis (CEA) with the Marginal Abatement Cost Curve (MACC). It assesses the costs per ton of CO_2 abated. CBA and CEA help inform policy strategies by prioritizing climate mitigation measures according to their cost efficiency. Many countries have applied the MACC in their national climate planning processes, e.g. Vietnam, Laos PDR, Mexico, Ethiopia. However, MACC have limitations: they do not capture interdependencies and co-benefits of mitigation measures, identify policy barriers or capture dynamic aspects such as declining costs and learning curves of mitigation technologies over time. The latter aspects need to also be considered in the process of prioritizing mitigation measures.

Figure 9 Marginal abatement cost curve of climate resilient green economy of Ethiopia



Source: CRGE Ethiopia, 2011.

3.1.4 Analyze costs and benefits against gender equality, social inclusion and just transition

Have you assessed the distribution of costs and benefits of climate actions from gender equality, social inclusion, and just transition perspectives?

Social, cultural, financial, and legal systems affect how the risks and benefits of climate action are distributed between different groups in society. Estimation of the costs, benefits, and potential trade-offs of climate interventions can improve the understanding of their distributional effects. Targeted measures can be developed to protect the groups that risk being affected over-proportionally (e.g. capacity building for new labor markets). In addition, identifying and assessing the potential of NDC/LT-LEDS measures for just and inclusive outcomes, e.g., for women, youth, and marginalized communities, will be critical to incorporate the justice dimension systematically. Alignment between macro-economic and climate policy is key to identify measures and programs that can channel direct finance toward the most vulnerable communities, women, and youth.

3.1.5 Assess employment effects of mitigation measures

Have employment effects of mitigation measures, e.g. job creation and loss, been assessed?

Countries should consider the labor market shifts linked to the NDC and LT-LEDS targets to capitalize on the ensuing employment opportunities and strengthen climate action. This includes quantifying job creation, loss and transformation (reallocated, qualifications, etc.): The net employment impacts of a transition to a green economy are the balance of job gains in new and losses in traditional sectors.

A qualitative assessment could focus on changes in labor demand, labor productivity, wages, and informality, participation of women and vulnerable populations, relationships with labor unions and overall impacts on national employment policies. This goes beyond human capital skills gaps, typically assessed, and includes: (1) the types of jobs created (e.g., engineers, administrative, technicians, etc.); (2) the workers' demographic and socioeconomic characteristics (e.g., age, gender, level of education and skills, etc.); (3) the compliance of the different aspects of decent jobs (e.g., wage levels, types of contracts, workplace health and safety, social protection), and (4) the spatial and location-specific aspects of jobs created/lost, are also assessed (ILO, 2012).

Estimations of net employment impacts are determined largely by the methodology applied, so a cautious assessment is needed (S. Stavropoulos, 2020). The GEM can qualitatively assess employment impacts, but the results must be validated and complemented by tools and methods such as Input-Output Analysis (IOA), Social Accounting Matrix (SAM), Local Employment Multipliers, Qualitative Employment Assessments, etc. The combination of such tools and models leads to robust Employment Impact Assessments (EmpIAs) described in **Tool 3** in **Annex III**.

BOX 6 Example: integration of gender aspects in LT-LEDS in Burkina Faso and Argentina

The government of **Burkina Faso** established gender focal points in each line Ministry (e.g., energy, transport, agriculture) to ensure that gender equality is addressed in the NDC process. Gender focal points from relevant ministries formed a gender technical group and played an important role in integrating available sectoral data, facilitated participation of local-level actors, and reviewed all the sectoral climate interventions from a gender and social inclusion perspective. Furthermore, strategic entry points were identified for integration of gender into the LT-LEDS, particularly by focusing on the green jobs assessments associated with the Net Zero and climate resilient targets. Pathways for ensuring readiness of the workforce were identified, particularly for women and youth in accessing future green jobs (Grafakos, et al. 2023).

Moreover, analysis of G20 members' LT-LEDS submissions reveals growing integration of gender and social inclusion considerations for a Just Transition. Several countries explicitly link just transition planning to equitable outcomes, though with varying degrees of specificity. For instance, **Argentina's LT-LEDS** includes "gender and diversity" as one of its cross-cutting approaches. Similarly, **Turkey's strategy** identifies "strengthening gender equality and inclusivity in labor markets under the most just conditions for everyone" as a core just transition objective. These examples underscore that while LT-LEDS are increasingly acknowledging distributional impacts of Just Transition, future iterations must move beyond recognition to actionable, quantified assessments of costs and benefits across different social groups, ensuring finance and programs are channeled to those most at risk of being left behind. (Van Tilburg, Grafakos, Quezada, & Oberholzer, 2025)

3.1.6 Assess the effects of mitigation measures on human capital (e.g. skills requirements), education systems and other aspects of labor market

Have human capital needs of mitigation measures, including skills needs, and the potential of education systems to address those needs been analysed?

EmpIAs help shed light on the underuse or mismatch of human capital with the skill set demand for mitigation and adaptation activities. Such assessments for the relevant economic sectors is imperative to inform labor productivity and education policies that support climate policy implementation. Human capital gaps can be quantitative and qualitative. Quantitative gaps refer to demand or supply for training programs and human talent in specific sectors or regions. Qualitative gaps refer to the quality and relevance of skills. By engaging with the private sector stakeholders in a given sector (e.g. through interviews or surveys) countries can better identify such gaps and imbalances in skills. The results of the assessments help develop dedicated educational programs such as Technical and Vocational Education courses and inform measures to integrate vulnerable groups into the labor force.

3.1.7 Integrate employment assessments and targets into climate plans and strategies

Have employment assessments and targets been integrated into climate plans?

Incorporating the results of EmpIAs into climate policies can promote more ambitious climate targets by highlighting the various positive effects on the labor market. Based on EmpIAs, countries such as Costa Rica, Indonesia, South Africa, and Spain have referenced green employment explicitly in one or more of their climate policies–NDC, NAP, LT-LEDS (ILO, 2024). Moreover, including employment targets within the NDCs and LT-LEDS can align socioeconomic development and climate policies. For example, informed by modeling of the Green Economy Index,[11] the National Development Planning Agency of Indonesia (BAPPENAS) targets having 1.8 million workers in various green economy sectors by 2030, including power, EV, land restoration, and waste. These targets are also mentioned in the corresponding sectoral development plans (ANTARA, 2022).

3.1.8 Quantify the effects of mitigation measures on trade and balance of payments

Have the effects of mitigation measures on trade and balance of payments been assessed?

Many countries, notably in the Global South, face balance of payments problems attributable to trade deficits and capital flight that constrain their development prospects. Implementing an NDC can have a positive effect on a country's trade balance by, for instance, reducing dependence on fossil fuel imports. Stabilizing the balance of payments through improved trade performance not only allows a country to grow faster, but it also increases the availability of foreign exchange and reduces foreign debt. In turn, these financial resources help finance NDC implementation. For countries that export fossil fuel, the same analysis identifies future economic risks that arise from decarbonization in the rest of the world. GGGI's tool assesses NDC's effect on a country's trade, balance of payments, and foreign debt (see **Tool 4** in **Annex III**).

11 https://lcdi-indonesia.id/wp-content/uploads/2022/08/Green-Economy-Index-A-Step-Forward-to-Measure-the-Progress-of-Low-Carbon-and-Green-Economy-in-Indonesia.pdf

BOX 7 Example: balance-of-payments analysis in Zambia

The tool was applied to **Zambia's National Green Growth Strategy** to show that the planned green policy interventions have a beneficial impact on the trade balance and, therefore, on the balance of payments. The analysis helped government experts understand how green growth achieves not only decarbonization but also contributes to macroeconomic stability and external debt reduction. The analysis of Zambia's balance-of-payments showed that the implementation of the country's National Green Growth Strategy significantly contributes to lower external debt owing to savings in fossil fuel imports and higher agricultural output. The Strategy thus generates a large amount of the resources required for green investment through savings in foreign currency. (MGEE, 2024)

STAGE 3.2: ADAPTATION

3.2.1 Assess how adaptation measures reduce economic losses and damages

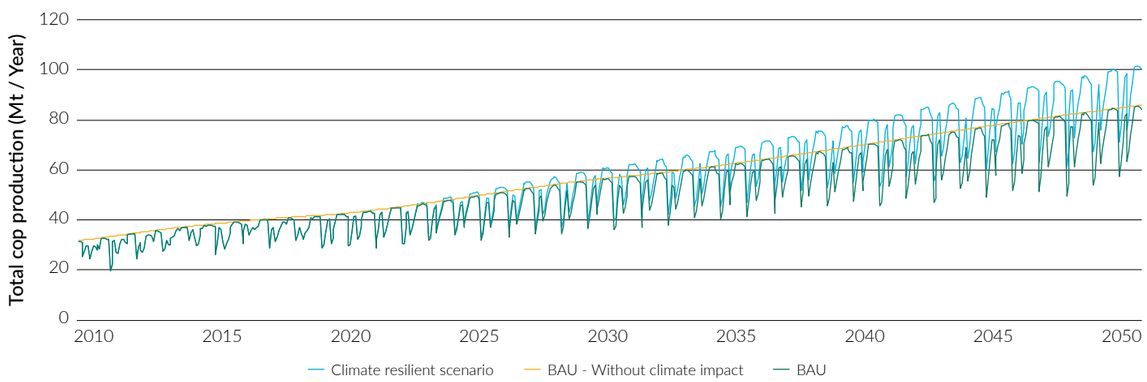
Have the reduced economic losses and damages from adaptation measures been assessed?

To enhance sectoral modelling with adaptation components, two approaches can be used: (i) bottom-up climate damage functions, which evaluate impacts on specific assets and sectors, providing detailed insights into how physical climate risks translate into sectoral vulnerabilities and economic losses – particularly effective for agriculture, energy, and infrastructure; and (ii) macro and top-down econometric regression analysis, which directly targets sectors at the macroeconomic level by analyzing historical relationships between climate variables and economic indicators. These approaches can be combined. Due to uncertainties, sensitivity and additional scenario analyses based on different projections should be employed in both approaches (see **Tool 5** in **Annex III** for more information).

BOX 8 Example: adaptation analysis in Ethiopia

In **Ethiopia**, climate impacts on agriculture were assessed by comparing different scenarios. Key climate variables, such as rainfall variability and increasing temperatures, were used to estimate changes in crop productivity. Figure 10 shows a significant decline in yields due to these climate stressors: between 2020 and 2050, Ethiopia's cumulative crop production losses attributable to climate change would amount to 201.5 million tons, representing 10.5% of the sector's maximum potential yield. These sectoral impacts translate into significant economic losses: an average 3.3% annual decrease in agricultural GDP until 2050. In the climate resilient scenario, the total crop production in the same period is 3.6 Mt higher than the BAU scenario without climate impacts. The assessment showed that adaptation measures, such as climate-smart agriculture practices and expanded water-efficient irrigation systems, can completely offset the adverse effects of climate change on crop production.

Figure 10 Total annual crop production in a BAU scenario with and without climate impacts, together with a climate-resilient scenario where climate adaptation actions are included



Source: Developed by authors.

3.2.2 Estimate the costs and investment requirements for adaptation measures

Have the costs of adaptation measures been estimated using relevant cost data?

Like mitigation, adaptation action involves costs assessed by multiplying identified adaptation targets by unit cost factors (e.g. cost per MW of electricity reserve capacity or per ha of climate-resilient crop production). Total investment requirements for adaptation action provide an overview of feasibility compared to available financial resources. A full-fledged CBA (see **Tool 2** in **Annex III**) allows cost-benefit comparison and efficient resource allocation that maximizes benefits during NDC implementation. Determining adaptation costs is essential: local cost data from similar previous actions should be used where available, or regional examples can provide proxies adjusted for national labor, material, and logistical costs to reflect the local economic context. Stakeholder discussions are needed to finalize cost assumptions to ensure consensus and feasibility.

3.2.3 Assess the impacts of adaptation measures on human capital and labor markets

Has the effect of adaptation measures on employment opportunities been assessed?

Like mitigation, adaptation can increase employment opportunities. For example, implementing nature-based solutions creates green jobs in farming, fisheries, forestry, and tourism – sectors dependent on healthy ecosystems. Moreover, adaptation improves decent employment by supporting individuals in vulnerable working conditions who rely on ecosystem services, enhancing wages, access to social security, labor representation rights, etc. To assess adaptation's labor impacts quantitatively and qualitatively, the same Employment Impact Assessment methods used for mitigation apply. Refer to Section 3.1.5 for further details.

3.2.4 Identify and assess synergies & co-benefits between mitigation and adaptation

Have synergies and co-benefits between mitigation and adaptation action been assessed?

Synergies between mitigation and adaptation can enhance overall climate strategy effectiveness and reduce trade-offs, particularly through stakeholder engagement, capacity-building, and policy coherence. Some mitigation actions with relatively low abatement potential may generate significant adaptation benefits, making them worth prioritizing in climate plans — for instance, urban nature-based infrastructure projects may not drastically reduce emissions but enhance resilience to heat waves and improve air quality. By systematically assessing and highlighting these co-benefits, decision-makers ensure that such actions are not overlooked, fostering a balanced approach to climate resilience whilst maximizing the likelihood of mobilizing diverse funding sources, as donors and investors favor actions with multidimensional effects aligned with sustainable development goals (see **Tool 6** in **Annex III**).

BOX 9 Example: costing adaptation in Sri Lanka's National Adaptation Plan

In the case of **Sri Lanka's National Adaptation Plan**, a pragmatic approach was used to estimate the investment cost for several hundred interventions by defining categories ranging from planning and policies to community engagement and physical infrastructure. These categories had estimated unit cost factors, which were multiplied by the quantitative ambition of the intervention.

BOX 10 Example: the role of labor adaptation planning in Spain and the Philippines

Spain's National Adaptation Plan (NAP) process is notable for its explicit integration of a human capital and labor market lens, particularly in its diagnostic phase. Spain's NAP formulation draws on information from the World Bank's Human Capital Index and its national labor force surveys to assess the employment impacts of adaptation programs such as Climate-Smart Agriculture (CSA) and Ecosystem-Based Adaptation (EbA) Projects. The Spanish NAP includes a specific action line on "Employment Creation and Protection Through adaptation," where it identifies adaptation measures as drivers of "labor formalization," "skills development," and "protection of labor productivity" from heat stress and vector-borne diseases. (MITECO, 2020).

Similarly, the **Philippines' National Climate Change Action Plan** (NCAAP) 2011-2028 and NAP 2023-2050 also prioritizes the creation of green jobs through adaptation measures. It draws insights from previous national green employment studies, such as the Greening the Philippine Employment Projections Model and existing policies such as the Philippine Green Jobs Act of 2016, which identifies "green" and "resilient" jobs in adaptation sectors. to establish informed action lines related to employment creation, skills development, and the informal economy related to adaptation activities. (Climate Change Commission Philippines, 2011; CCC & DENR, 2023; The LAWPHiL Project, 2015; Abrigo et al., 2021).

BOX 11 Example: analysis adaptation co-benefits in Ethiopia

As part of **LT-LEDS' development in Ethiopia**, sectoral working groups identified and assessed synergies and trade-offs in detail. **Table 3** illustrates the results of the assessment of the forestry working group. It shows the main adaptation synergies and trade-offs of the mitigation measures in forestry.

Table 3 Adaptation co-benefits and trade-offs with mitigation in forestry for Ethiopia's LT-LEDS

MITIGATION ACTION	ADAPTATION SYNERGIES	ADAPTATION TRADE-OFFS
• Reduced deforestation • Afforestation/ reforestation • Forest restoration	• Ecosystem services conservation • Improvement in water-related ecosystem services • Reduced influence of heat island effect in urban areas • Income diversification (nontimber forest products) • Creation of green jobs • Carbon offset funds provide opportunities to protect and restore native ecosystems, with corresponding gains for biodiversity and reductions in carbon • Reforestation that connects fragmented forests reduces exposure to forest edge disturbances • The use of fertilizer-fixing trees can improve soil fertility through nitrogen fixation by increasing the supply of nutrients for crop production	• Reduced food security • Potential land competition • Local benefits, particularly for indigenous communities, will be accrued only if land tenure is respected and protected legally

Source: Ethiopia LT-LEDS, 2023.

3.2.5 Analyze costs and benefits from gender equality and social inclusion perspectives

Have costs and benefits of adaptation measures been analyzed, considering gender equality and social inclusion aspects?

Adaptation interventions can have various effects on different groups of society. Estimation of their costs, benefits, and potential trade-offs can improve understanding of the distributional effects. Targeted measures can be developed to protect groups that risk being disproportionately affected - for example, by providing capacity building for smallholder farmers or supporting climate-resilient livelihoods for women in vulnerable communities. In addition, identifying and assessing the potential of adaptation measures within NDCs or NAPs for just and inclusive outcomes - particularly for women, youth, and marginalized communities - is critical to systematically incorporate the justice dimension. This process could, for example, identify measures that channel direct finance towards the most vulnerable communities, women, and youth.

STAGE 3.3: LOSS AND DAMAGE (L&D)

Climate-sensitive economic risks, losses, and damages (L&D) refer to measurable effects of climate change on economic activities, livelihoods, and resources - both direct (e.g., crop loss from drought) and indirect (e.g., supply chain disruptions attributable to extreme weather events). L&D can be defined as residual climate-induced losses and effects that adaptation actions cannot mitigate. Beyond modeling approaches, non-modeling methods, such as contingency surveys, Post-Disaster Needs Assessments (PDNAs), and participatory approaches, play a complementary role, particularly in data-limited contexts or where qualitative insights are essential. These approaches should be integrated into NDC planning and implementation.

3.3.1 Quantify climate-sensitive economic risks, losses, and damages

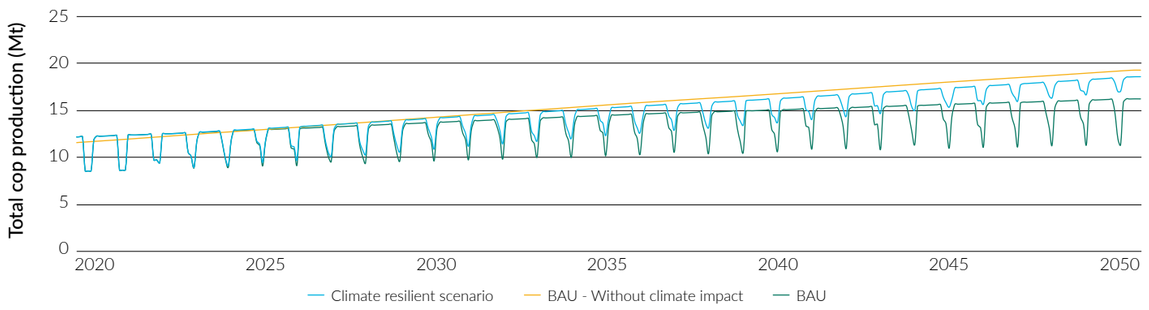
Does the assessment quantify climate-related economic risks, losses, and damages, considering both modeling and non-modeling approaches?

Modelling climate-induced economic impacts follows a similar approach both at sectoral and national levels. However, irreversible climate-induced L&D can be determined by impacts that remain or cannot be eliminated by adaptation interventions. Non-modeling approaches are equally valuable, especially where modeling capacity or real-time data are limited. PDNAs conducted immediately after extreme weather events provide detailed evaluations of economic losses and recovery needs across sectors. Contingency Surveys involve collecting data from stakeholders (e.g., farmers, businesses, households) to estimate potential losses and adaptive capacity under projected climate scenarios. They are particularly useful for capturing localized impacts and qualitative factors that models may overlook. Other participatory approaches, such as focus groups and workshops, help integrate community knowledge and experiences into L&D assessments (see **Tool 7** in **Annex III**).

BOX 12 Example: assessment of L&D in Burkina Faso's LT-LEDS

In modeling crop production in **Burkina Faso as part of LT-LEDS development**, three scenarios were developed: BAUs with and without climate impacts, and a climate resilient scenario with adaptation actions. Projected losses in crop production attributable to climate change between 2020 and 2050 were estimated at 59.6 million tons (13% of maximum potential yield) in the BAU scenario. Climate adaptation measures, as modelled in the climate resilient scenario, reduced adverse climate impacts on the agricultural sector by bringing crop production closer to the maximum potential level in 2050. Projected losses in crop production are estimated to be much lower, at 25.2 million tons (5% of maximum potential yield). However, results suggest that while the national adaptation targets need to be even more ambitious if they are to fully offset the effects of climate change.

Figure 11 Total crop production in Burkina Faso between 2020 and 2025 in 3 scenarios.



Source: Burkina Faso LT-LEDS, 2024.

3.3.2 Quantify financial implications of climate-induced losses and damages

Does the assessment quantify climate-induced financial losses?

Financial effects of climate-related losses at the national level can be estimated, for example, through a reduction in labor income, deterioration in government budgets, or shifts in budget priorities. For instance, rising temperatures can reduce labor productivity in agriculture and construction, decreasing income, consumption, tax revenues, and public investments that rely on tax revenues. Prolonged climate events such as droughts or floods can reduce national production, requiring additional funding for social safety nets, subsidies, or stimulus programs. Frequent disasters lead to reallocation of public funds to recovery and reconstruction, diverting investment from long-term development priorities. These financial effects can be modeled and assessed using system dynamics tools like the GEM to forecast financial risks, identify financing gaps, and inform the design of resilient fiscal policies.

3.3.3 Identify and prioritize interventions to avert, minimize and address economic L&D

Have the actions to improve governance, secure international funding, and address economic losses while aligning with local and global goals been prioritized?

Key actions in addressing L&D include strengthening governance, readiness, and capacity. Improving readiness to access international funding, e.g. from the Loss and Damage Fund, requires strengthening institutional frameworks, enhancing transparency, and developing robust project proposals aligned with international funding criteria. The inclusion of climate risk insurance, contingency funds for disaster recovery, and labor market programs in funding proposals demonstrates alignment with global climate objectives. External funding complements domestic efforts and allows to implement priority interventions without compromising development goals. At the sectoral level, interventions must be guided by a CBA or multi-criteria decision analysis (MCDA). Engaging stakeholders including the private sector helps to prioritize measures consistent with local needs and capacities.

STAGE 4: FINANCE

4.1 Estimate financial resources required to implement planned climate action

Does the climate plan or strategy estimate the financial resources required to implement planned mitigation and adaptation actions?

Developing a financing strategy begins with specifying financial resources required for mitigation and adaptation interventions in the climate plan or strategy, which can be performed through CBA (see **Tool 2** in **Annex III**). A bottom-up approach can also estimate financial requirements but requires detailed knowledge of all planned mitigation and adaptation projects. Project-level data can be retrieved from sectoral development or climate finance strategies.

4.2 Estimate current finance flows for climate actions

Does the estimation of current finance flows for climate action identify and differentiate sources (public/private/blended, domestic vs. international), types, and sectors?

After estimating investment costs, identify existing climate finance spending from all sources across four aspects: first, thematic scope (mitigation, adaptation, L&D, etc.) and sectoral direction (energy, agriculture, forestry, water, etc.); second, source (private or public); third, type (listed or private equity; debt, e.g. corporate debt, sovereign bonds, etc., or grants/donations), and fourth, geographical source (domestic or international, including bilateral and multilateral donor funding). Financial flows at the national level can be assessed using a top-down or bottom-up approach. The top-down approach uses data from institutionalized reporting systems on climate change expenditure in the budgeting process or international climate finance tracking statistical tools. A bottom-up approach considers the costs of specific mitigation and adaptation projects. These two approaches should be complementary.

At this stage, it is also necessary to analyze the national landscape of climate financing, including governance and financial regulators. A proper environment can unlock economic investments and increase future climate finance flows. For example, providing domestic public incentives, such as taxes and fees, subsidies, tax breaks, guarantees, and risk mitigation instruments, can redirect finance toward more sustainable projects in the short to medium term. Moreover, implementing green finance taxonomies, finance disclosure regulations, ESG policies for the banking system, etc., can enhance climate finance in the long term.

BOX 13 Example: financial flow analysis in Sri Lanka

Sri Lanka's Climate Prosperity Plan (LT-LEDS) exemplifies the analysis of the breakdown of financial flows to determine financial needs. Moreover, it includes financing targets such as the percentage of renewable energy to be financed by a specific year (Government of Sri Lanka, 2023).

4.3 Plan financing low-carbon investment in line with sustainable debt, price stability, and considerations of the cost of capital

Is the financing plan for low-carbon investment aligned with sustainable debt, price stability, and considerations of the cost of capital?

Mobilizing financial resources to implement climate plans and strategies has significant macroeconomic consequences. Countries must structure the finances to implement climate plans in a way that ensures price stability, a sustainable debt level, affordable for the public sector and the financial system, and a robust balance of payments that avoids excessive foreign debt accumulation. Otherwise, large-scale green investment risks causing financial instability or crises, exchange rate depreciation, and inflation. GGGI's stock-flow-consistent tool supports NDC financial planning (see **Tool 8** in **Annex III**).

4.4 Assess the climate finance gap and climate finance environment

Has the climate finance gap been assessed, and climate finance environment evaluated?

Financial flows can be forecasted for different scenarios using historical data and multiple assumptions, such as the country's reliance on donor funding and capacity to use private finance. Similarly, financial requirements can be forecasted under different scenarios. The difference between the two reveals the "financing gap" (see **Tool 9** in **Annex III**). Countries need to differentiate, to the extent possible and as realistically as possible, between what they can finance on their own and what they need additional finance for. Quantifying the financial gap can help the countries receive international support for their climate policy implementation more easily as it provides transparency on the concrete amount of needed resources.

4.5 Identify (climate) finance sources that could be leveraged to close the gap

Did you identify potential climate finance sources to close the finance gap?

Closing the finance gap requires blending traditional finance – i.e., grants and (concessional) loans – with innovative financial instruments that can unlock (private) investment (carbon pricing, debt-for-nature swaps, etc.). Selected instruments should balance mature, emerging, and pilot options to finance adaptation or mitigation in the short-, medium-, and long term. Using diverse sources – financial institutions, private and institutional investors (e.g. pension funds), impact investors, foundations, philanthropists, etc. – helps to avoid over-reliance on a single source such as international finance. Instruments that exert fiscal pressure should also be avoided.

Stakeholder coordination mechanisms are needed to validate climate finance instruments, given the roles of public and private actors in the implementation. Ministries of Finance and Environment must coordinate with central banks, financial sector regulators, donors and development finance institutions to incentivize private and public banking sector action. Private-sector financers should confirm their willingness and ability to use specific instruments. At this stage, analysts could recommend how to improve public financial management and incorporate ESG policies in the banking system for better climate finance environment.

Using market mechanisms (including domestic emissions trading systems or engagement in international carbon markets) can create incentives to crowd-in private sector to bridge the finance gap. Engaging in carbon markets under Article 6 of the Paris Agreement, for example, can help finance the implementation of the hard-to-abate mitigation measures (emissions reductions and removals) by providing international investment flows through the trading of "Internationally Transferred Mitigation Outcomes" or ITMOs. However, countries must decide which investments are eligible to incorporate carbon finance and put systems in place to authorize, track and report transactions as Art. 6 implies corresponding adjustments to their emissions balance against their NDCs upon transferring credits internationally. While Art. 6 can play a meaningful a role in making mitigation investments more viable, governments should carefully consider how to mitigate the risk of overselling against their unconditional NDC targets, and ensure robust accounting and environmental integrity of all projects.

In practice, countries engaging in Art. 6 develop clear strategic parameters for cooperation, including indicative "carbon budgets" for tardes, consistent with NDC and LT-LEDS pathways, as well as transparent criteria for the authorization of activities (to ensure alignment with priority development objectives, e.g. through positive or negative lists). Developing such parameters requires a clear vision and set of objectives for Art. 6 participation and sufficient information on abatement costs and the wider costs and benefits of trading ITMOs across different sectors and activities. Integrating Art. 6 in climate finance strategies is therefore critical to identify what this new form of engagement can support, before identifying specific measures to help align Art. 6 engagement with desired objectives.

4.6 Use quantified co-benefits to prioritize investments in key economic sectors

Does the climate plan or strategy prioritize investments based on quantified co-benefits and financial returns?

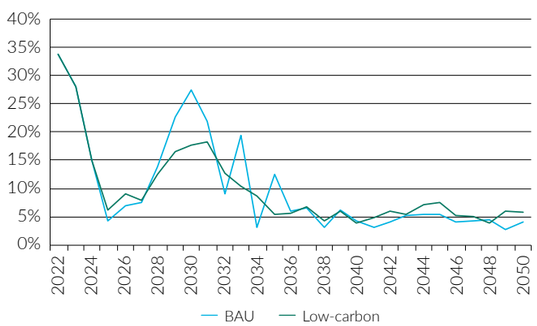
If mitigation and adaptation interventions undergo CBA (see **Tool 2** in **Annex III**), its results inform investment timelines and financial planning. Low-cost investments or those with quick returns could be prioritized early. As interventions are implemented, the country's economic capacity and resilience increase, enabling higher debt levels without jeopardizing economic stability. High-cost, low-carbon investment may come later in NDC implementation timeline to align with development and macroeconomic goals.

BOX 14 Example: investment planning for Ethiopia's LT-LEDS

The results of the stock-flow-consistent model for **Ethiopia's LT-LEDS** show that the government can make the intended low-carbon investments without fearing additional inflation. Moreover, the country can finance most of the required low-carbon investments by its own banking system and needs to resort to foreign finance for only a minor part. These results help government stakeholders see the feasibility and implications of drafting a decarbonization investment strategy based on the country's own financial capacity.

Figure 12 Effects of LT-LEDS implementation on debt, price stability, and lending activities

a) Inflation rate



b) Balance sheet of commercial banks in the low-carbon scenario in 2050 in 2022-level (ETB billion)

ASSETS		LIABILITIES	
Loans to firms	239	Firms' deposits	18,761
Central bank reserves	30,233	Financial investors' deposits	1,491
		Workers' deposits	10,311
		Borrowings from central bank	30,472
Total	30,472	Total	30,472

Source: Developed by authors based on Oberholzer (2026).

BOX 15 Example: assessment of the climate finance gap in Burkina Faso

In **Burkina Faso's LT-LEDS** a climate finance gap amounted to 40% of the total finance requirement. The estimated funding gap was likely to increase due to the effects of COVID-19 and domestic conflict, which changed government spending priorities. In addition, the cost of adaptation is rising faster, while the increase in funds committed, disbursed and in access to funds remains slow and unpredictable. This analysis informs policymakers on the focus and efforts required to close the finance gap.

BOX 16 Example: inclusion of carbon finance in Colombia's NDC

In an analysis linked to **Colombia's NDC** modelled the potential of ITMOs traded under Article 6 of the Paris Agreement to contribute to additional carbon finance and private-sector climate investment. Results showed that even though the country cannot count any emission reductions transferred to investors abroad toward its own NDC targets, they nonetheless give rise to domestic benefits such as job creation, fiscal revenue generation and ecosystem restoration, among others.

4.7 Analyze the use of fiscal and regulatory policies to provide incentives to economic actors and generate revenues to implement climate action

Has the use of fiscal and regulatory policies to incentivize green investments and generate revenues for climate action been assessed?

Before proposing new regulatory and fiscal policies, governments must review institutional, policy, and political economy structures to identify obstacles to green investment and the need for policy reforms. Fiscal instruments and regulatory reforms, such as phasing out fossil fuel subsidies, using carbon taxes and fiscal incentives for low-carbon technologies, can support NDC/LT-LEDS implementation. These reforms encourage private investment to achieve climate targets whilst generating public revenue and compensating vulnerable groups and those adversely affected. Relevant Ministries, e.g., the Ministry of Finance, should evaluate potential fiscal instruments within a broader reform framework considering the country's fiscal context by identifying priority sectors, analyzing instruments based on their environmental, fiscal, and social effects, and tailoring solutions to the country's specific needs (see **Tool 10** in **Annex III**). This ensures that fiscal policies are well-designed, aligned with national climate goals, and contribute to a just and efficient transition. They create a predictable policy environment, attract private investment, and foster green innovation in key sectors. This approach enhances climate actions' financial sustainability and credibility of NDC/LT-LEDS commitments.

Assessing fairness & social inclusion of fiscal reforms (how they affect different groups, whether vulnerable and low-income groups would be disproportionally affected e.g. through price increases) is key for their design and effective implementation. For instance, it needs to be analyzed how equity measures like redistribution or progression can be included in the reforms to prevent or reduce inequalities.

BOX 17 Example: fossil fuel subsidy reform scenarios for Saint Lucia's NDC enhancement

During **NDC enhancement, Saint Lucia** explored different scenarios on phasing out fossil fuel subsidies (GGGI, 2021). A BAU scenario and three alternative fossil fuel subsidy reform (FFSR) scenarios were developed and assessed. All scenarios were simulated to analyze the socioeconomic and carbon emissions effects of FFSR. The assessment focused on 1) phasing out fossil fuel subsidies on Liquefied Petroleum Gas (LPG) and 2) removing the price cap on gasoline and diesel. The assessment of scenarios and close consultation with stakeholders identified the "FSSR R10" scenario as the most beneficial. It foresees gradual linear removal of fossil fuel subsidies and price caps and reallocation of increased revenues (for 10 years), specifically:

- The subsidy on LPG 20lbs and 22lbs and the price cap on gasoline and diesel are removed gradually over five years beginning in 2022.
- The increased annual revenues are reallocated in debt reduction (40%), investment in renewable energy (15%) and energy efficiency (15%), and compensation to low-income households (30%).
- By 2030, annual average subsidy savings will be approximately XCD 28 million (around USD 10,37 million).

In 2032, the following outcomes can be expected:

- The energy bill will be decreased by 3.5% compared to the BAU scenario.
- The annual GDP will increase by 1.9% compared to the BAU scenario.

The CO_2 emissions will be reduced by 16.4% compared to the BAU scenario.

STAGE 5: IMPLEMENTATION AND MONITORING

5.1 Allocate resources required to implement climate action

Have financial and technical resources been allocated to implement climate plans and strategies?

The finance gap analysis (**Tool 9** in **Annex III**), the financial planning tool (**Tool 8**), and fiscal analysis (**Tool 10**) provide the foundation for the NDC/LT-LEDS implementation plan as well as climate finance aspects of the Biennial Transparency Reports (BTRs). In addition to purely financial resources, the government must also consider the need for technical expertise in certain sectors. Moreover, green investment experts and monitoring specialists e.g. at the Ministries of Finance should take part in the process. Capacity building may be required, the costs of which should also be considered.

5.2 Integrate climate (e.g. NDC/LT-LEDS) finance plan into macroeconomic framework

Has the climate finance plan been integrated into the country's macroeconomic framework, considering its economic effects on fiscal and monetary policies?

NDC policy interventions need to be integrated into macroeconomic framework to ensure that authorities account for their effects in economic planning, fiscal and monetary policies. The SFC model (see **Tool 8**) simulates macroeconomic effects of implementing the NDC/LT-LEDS.

BOX 18 Example: financial planning for climate mitigation and resilience in Rwanda

With the completion of the **Resilience and Sustainability Facility (RSF), Rwanda** made significant progress in integrating climate considerations into macroeconomic policies. The International Monetary Fund (IMF) assessed macroeconomic impacts of planned climate-focused projects and reforms in Rwanda and proposed sustainable financing strategies. Simulations were conducted using the IMF's Debt-Investment-Growth-Natural-Disasters (DIGNAD) model that suggest that full NDC implementation has sizeable fiscal costs but could improve Rwanda's macroeconomic stability if accompanied by proper policy and financing mix. In particular, Domestic Revenue Mobilization and spending rationalization are key to increasing fiscal space and safeguarding debt sustainability. Furthermore, advancing reforms under the RSF helps to increase public investment efficiency and catalyze additional climate financing, thereby addressing the risk of crowding out other development spending. (IMF, 2023; IMF, 2024).

5.3 Integrate climate strategies and plans into the country's budgeting process

Have climate plans and strategies been integrated into the country's budgeting process?

Climate interventions must be part of the budgeting process from the start so that their cost implications are properly appreciated. This involves transparency and clarity about sectoral budgets and the funds' allocation at various levels, from national to local. This helps different government levels to identify synergies with already planned expenditures (e.g. "greening" existing projects according to NDC targets with little additional cost). Existing investment plans may need adjustment to integrate those synergies.

BOX 19 Example: climate budget tagging in Uganda

Uganda has made significant efforts in systematically integrating its national climate strategies into the core of the government budgeting process. This integration is primarily achieved through piloting its Climate Change Budget Tagging (CCBT), a mandatory tool instituted by the Ministry of Finance, Planning and Economic Development (MoFPED) in collaboration with the Climate Change Department (CCD) under the Ministry of Water and Environment. (Climate Analytics Africa, 2024) Since the Financial Year 2019/2020, all sector ministries, departments, agencies, and local governments have been required to tag, track, and report climate-related expenditures in their Ministerial Policy Statements and Budget Framework Papers. This process, aligned with the National Climate Change Policy (2015) and the NDC, ensures transparency by, for example, identifying, how much of the agriculture sector's budget is allocated to climate-smart agriculture practices or how urban development funds are directed towards resilient infrastructure. This system allows the government to identify synergies, "green" existing budget lines, and direct investments toward NDC priorities, ensuring that adaptation and mitigation are not afterthoughts but are financed and planned from the outset of the annual budget cycle. (World Bank Group, 2025).

5.4 Allow climate plan implementation to adapt to evolving economic circumstances

Is climate plan implementation flexible enough to respond to changing economic circumstances, such as shifting funds or timelines due to unforeseen events?

NDCs or LT-LEDS usually include more than one low-carbon scenario to account for future uncertainties (e.g. technological change, global and domestic geo-political environment, economic circumstances). Policymakers should regularly monitor the ambitiousness of climate goals and adjust them if needed. For instance, when a humanitarian crisis occurs due to a natural disaster, funds may have to be reallocated. The LT-LEDS needs to be adjusted to achieve the long-term decarbonization targets.

5.5 Develop integrated climate and economic development monitoring and evaluation

Is an integrated climate and economic development monitoring and evaluation system in place to track climate investments?

To measure implementation of NDC/ LT-LEDS investments, the government should evaluate the integration of climate finance flows in the government budget and the private financial sector. This requires quantifying physical and transitional climate risks, assessing how economic actors and financial sector participants contribute to reducing those risks, and changing course, if those risks remain elevated. For countries participating in Article 6, monitoring and evaluation frameworks should also track the authorization, transfer and use of ITMOs and ensure that these are consistently reflected in climate, budgetary and economic reporting, including MRV and transparency arrangements.

4

Concluding Remarks

NDCs and LT-LEDS represent countries' commitments to reduce GHG emissions and address the effects of climate change while supporting the achievement of economic development objectives. Integrating macroeconomic and financial considerations into national climate plans and strategies is essential to ensure that financial resources are optimized, climate-induced economic and transition risks are minimized, and economic opportunities for inclusive green growth and development of green industries are maximized. This guide is designed to help ministries of environment, finance and economic planning, climate policymakers, economic planners, and experts in relevant sectors identify key opportunities and entry points to make fiscal policies and macroeconomic frameworks consistent with climate objectives and incorporate macroeconomic and finance considerations in the national climate policy and planning processes. Strengthening this integration enhances credibility and ambition of climate commitments, fosters resilient economic systems, and supports the transition to low-carbon, climate-resilient, inclusive, and green economy pathways. This guide also presents tools and methods that GGGI is utilizing and customizing to support countries in incorporating macroeconomic and finance issues in their climate policy development processes. Tools and methods presented in this guide are not exhaustive, but cover a range of relevant topics, whilst building on existing modeling practices and capacities of governments.

5

Additional Sources

Abrigo, Michael, Danica Ortiz, Aniceto Orbeta, and Gilberto Llanto (2021): *Greening the Philippine Employment Projections Model: New Estimates and Policy Options*. Philippine Institute for Development Studies. https://doi.org/10.62986/dp2021.26.

Antara (2022): Bappenas aims to add 1.8 mln green economy workers by 2030. ANTARA Indonesian News Agency. https://en.antaranews.com/news/243637/bappenas-aims-to-add-18-mln-green-economy-workers-by-2030.

Burkina Faso LT-LEDS (2024): Adoption of Burkina Faso long-term low-emission development strategy (LT-LEDS). Vision 2050 de développement à faible émission de carbone et résilient au climat du Burkina Faso. https://gggi.org/report/adoption-of-burkina-faso-long-term-low-emission-development-strategy-lt-leds/.

Climate Analytics Africa (2024): Guidelines for Mainstreaming Climate Action in the Financial Sector of Uganda. https://finance.go.ug/sites/default/files/reports/Guidelines%20for%20Mainstreaming%20Climate%20Action%20in%20the%20Financial%20Sector.pdf.

CCC & DENR (2023): National Adaptation Plan of the Philippines 2023-2050. Climate Change Commission (CCC) and Department of Environment and Natural Resources (DENR). https://www.climate.gov.ph/public/ckfinder/userfiles/files/Knowledge/PH%20NAP%202023-2050.pdf.

Climate Change Commission Philippines (2011): National Climate Change Action Plan 2011-2028. https://policy.asiapacificenergy.org/sites/default/files/NCCAP_TechDoc.pdf.

Coalition of Finance Ministers for Climate Action (2022): How to Scope the Fiscal Impacts of Long-Term Climate Strategies. https://www.financeministersforclimate.org/sites/cape/files/inline-files/How%20to%20Scope%20the%20Fiscal%20Impacts%20of%20Long-Term%20Climate%20Strategies.pdf.

CRGE Ethiopia (2011): Ethiopia's Climate-Resilient Green Economy - Green economy strategy. Federal Democratic Republic of Ethiopia https://www.epa.gov.et/images/Polices/CRGE_Strategy_Final.pdf.

Ethiopia LT-LEDS (2023): Ethiopia's long term low emission and climate resilient development strategy (2020-2050). Ethiopia. https://unfccc.int/sites/default/files/resource/ETHIOPIA_%20LONG%20TERM%20LOW%20EMISSION%20AND%20CLIMATE%20RESILIENT%20DEVELOPMENT%20STRATEGY.pdf.

Fazekas, Andreas, Christopher Bataille, and Adrien Vogt-Schilb (2022): Achieving Net-Zero Prosperity: How Governments Can Unlock 15 Essential Transformations. Inter-American Development Bank. https://doi.org/10.18235/0004364.

GCF (2019): Guidelines on preparing the economic and financial analysis for SAP proposals. https://www.greenclimate.fund/document/guidelines-preparing-economic-and-financial-analysis-sap-proposals.

GGGI (2021): Fossil Fuel Subsidy and Taxation Reform Scenarios Modelling for Saint Lucia. https://gggi.org/wp-content/uploads/2021/09/Saint-Lucia-Fossil-Fuel-Subsidy-and-Taxation-Report-Scenario-Modelling-2.pdf.

GGGI and GIZ (2024): Aligning NDCs and LT-LEDS: A Step-by-Step Guide for Practitioners. https://gggi.org/report/aligning-ndcs-and-lt-leds-a-step-by-step-guide-for-practitioners/.

GGGI (2024a): GGGI Service Offering for Enhancement and Implementation of Nationally Determined Contributions (NDCs). https://gggi.org/wp-content/uploads/2024/08/GGGI_GN_NDC_FIN.pdf.

GGGI (2024b): The Integration of Gender and Social Inclusion in Climate Action through Enhanced NDCs. Guidance Note. https://gggi.org/wp-content/uploads/2024/07/GGGI_GN_GESI.pdf.

Government of Hungary (2021): National Clean Development Strategy 2020-2050. Ministry of Innovation and Technology. https://unfccc.int/sites/default/files/resource/LTS_1_Hungary_2021_EN.pdf.

Government of Sri Lanka (2023): Sri Lanka Climate Prosperity Plan. PRELIMINARY REPORT. https://unfccc.int/sites/default/files/resource/SriLanka_LTLEDS.pdf.

Grafakos, Stelios, Basil Oberholzer, Laura Jalasjoki, Shivenes Shammugam, Diana Quezada, and Ingvild Solvang (2023): Accelerating Transformative Climate Action through Long Term – Low Emission and Climate Resilient Development Strategies, GGGI Insight Brief 8. https://gggi.org/report/accelerating-transformative-climate-action-through-long-term-low-emission-and-climate-resilient-development-strategies.

ILO (2012): Decent Work Indicators. Concepts and Definitions. ILO Manual – First Version. International Labor Organization (ILO). Switzerland. ISBN 978-92-2-126426-2. https://webapps.ilo.org/public/libdoc/ilo/2012/470465.pdf.

ILO (2024): Work programme on just transition pathways referred to in the relevant paragraphs of decision 1/CMA.4 and CMA5. Submission by the International Labour Office. https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202404301925---ILO%20Submission.Case%20Studies%20JTWP%201st%20Dialogue.pdf.

IMF (2023): Challenges and Policy Options to Financing Rwanda's Climate Agenda. Volume 2023: Issue 423. African Dept. https://doi.org/10.5089/9798400261046.002.

IMF (2024): IMF Executive Board Concludes the Fourth Reviews under the Policy Coordination Instrument and the Resilience and Sustainability Facility, and the Second Review under the Stand-by Credit Facility for Rwanda. Press Release No. 24/469. https://www.imf.org/en/news/articles/2024/12/13/pr-24469-rwanda-imf-concludes-4th-rev-under-pci-and-rsf-and-2nd-rev-under-stand-by-cred-facility.

Kalra, Nidhi, Edmundo Molina-Pérez, James Syme, et al (2023): The Benefits and Costs of Reaching Net Zero Emissions in Latin America and the Caribbean. Inter-American Development Bank. https://doi.org/10.18235/0005330.

Luscombe, Hannah, Emma Richardson, Vivien Foster, et al (2024): "Data-to-Deal (D2D): An Emerging and Effective Approach to Financing the Climate Transition." Preprint, February 8. https://doi.org/10.33774/coe-2024-21xv4-v3.

MGEE (2024): National Green Growth Strategy 2024-2030. Ministry of Green Economy and Environment (MGEE), Zambia. https://www.cabinet.gov.zm/newsite/wp-content/uploads/2024/04/2NATIONAL-GREEN-GROWTH-STRATEGY-2024-2030-6.pdf.

MITECO (2020): Plan National de Adaptación al Cambio Climático 2021-2030. Ministerio para la Transición Ecológica y el Reto Demográfico. Madrid, Spain. ISBN: 978-84-18508-32-5. https://www.miteco.gob.es/content/dam/miteco/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/pnacc-2021-2030_tcm30-512163.pdf.

NDC & GCF (2024): Climate Investment Planning and Mobilization Framework. https://ndcpartnership.org/sites/default/files/2024-12/climate-investment-planning-and-mobilization-framework.pdf.

NDC & UNFCCC (n.d.): NDC 3.0 Navigator. https://ndcnavigator.org/.

NDC Partnership Support Unit (2023): NDC Investment Planning – Guide and Checklist. https://ndcpartnership.org/sites/default/files/2023-09/ndc-investment-planning-guide.pdf.

Oberholzer, Basil (2026): How to Finance Green Growth in Ethiopia. International Journal of Political Economy, forthcoming.

The LAWPHil Project (2015): Republic Act No. 10771: An Act Promoting the Creation of Green Jobs, Granting Incentives and Appropriating Funds Therefor. Republic of the Philippines. Congress of the Philippines. Metro Manila. Metro Manila. https://lawphil.net/statutes/repacts/ra2016/ra_10771_2016.html.

2050 Pathways Platform (2022): Enhancing Long-Term Low-Emission Development Strategies: Macroeconomic and Fiscal Issues. https://2050pathways.org/resource-hub/enhancing-long-term-low-emission-development-strategies-macroeconomic-and-fiscal-issues/.

UNDP (2022): Planning for a Net Zero Future: Guidance on How to Develop a Long-Term Low-Emission Development Strategy (LT-LEDS). https://www.undp.org/publications/planning-net-zero-future-guidance-how-develop-long-term-low-emission-development-strategy-lt-leds.

Van Tilburg, Xander; Grafakos, Stelios; Quezada, Diana; Oberholzer, Basil (2025): Just Transitions in LT-LEDS: A G20 Review. Insight Brief. GGGI. https://gggi.org/report/just-transition-in-lt-leds-a-review-of-g20-submissions/.

WHO (2024): Quality criteria for integrating health into Nationally Determined Contributions (NDCs). Geneva: World Health Organization. ISBN 978–92–4-010374–0. https://iris.who.int/server/api/core/bitstreams/a5d2c07a-52b9-4b8c-93aa-e39e4d8a5f85/content.

World Bank Group (2025): Uganda Country Climate and Development Report. CCDR Series. http://hdl.handle.net/10986/43167.

WWF (2024): WWF CHECKLIST FOR THE NDCs WE WANT. https://wwfint.awsassets.panda.org/downloads/1-ndc-checklist-portrait-2024-v4.pdf.

Annex I: Checklist for Aligning Climate and Economic Planning

Table 4 Checklist for aligning climate and economic planning

STAGES OF THE NATIONAL CLIMATE ACTION PLANNING PROCESS	STEPS OF THE NATIONAL CLIMATE ACTION PLANNING PROCESS	ENTRY POINTS TO INCORPORATE ECONOMIC AND FINANCIAL ASPECTS	CHECKLIST (YES/NO/ PARTIALLY), COMMENTS
Stage 1 Governance Structure and Coordination	1.1 Engage the Ministries of Economy and Finance in climate policy processes	Are the Ministries of Economy and Finance actively involved in the development of national climate plans and strategies?	
	1.2 Establish effective and coherent cross-sectoral coordination and governance	Have cross-sectoral coordination mechanisms and governance structures been established to ensure economic considerations are integrated into climate planning?	
	1.3 Ensure coherence between national climate and economic development planning and policy processes	Have economic and financial aspects been integrated into sectoral climate planning, and have climate indicators been included in national economic development strategies? Does the country ensure coherence between national climate change strategies and economic development plans to promote green growth and effective climate action?	
Stage 2 Current Policy Landscape, Priorities, and Context	2.1 Analyze the national economy and policy context	Has the national economy and policy context been analyzed to consider how existing economic, climate, and environmental policies enable or hinder climate action?	
	2.2 Collect the most recent economic data, identify risks and select analytical tools	Has economic data been collected to identify past climate-induced losses and damages and potential climate-induced risks and inform the choice of analytical tools for climate planning?	
Stage 3 Integrated Macroeconomic Analysis Framework - Mitigation, Adaptation, L&D	3.1 Assess macroeconomic effects of climate interventions and scenarios	Have you assessed the macroeconomic impacts of climate interventions on GDP, employment and fiscal stability? Is your country conducting detailed macroeconomic assessments of climate interventions beyond conventional modeling approaches?	
	3.2 Conduct expert consultations to refine outcomes of macroeconomic analysis	Do the assumptions, data inputs, and modeled outcomes of macroeconomic analyses reflect real-world economic conditions and sector-specific realities as best as possible or need to be refined?	
Stage 3.1 Mitigation	3.1.1 Identify socioeconomic benefits and effects of mitigation measures	Have socioeconomic benefits and potential adverse effects of mitigation measures been identified?	
	3.1.2 Assess the investment requirements for mitigation measures	Have the investment needs for mitigation measures been assessed to prioritize actions based on available resources?	
	3.1.3 Quantify and monetize costs and benefits of mitigation measures	Have costs and benefits of mitigation measures been assessed to inform prioritization?	
	3.1.4 Analyze costs and benefits against gender equality, social inclusion, and just transition	Have you assessed the distribution of costs and benefits of climate actions from gender equality, social inclusion, and just transition perspectives?	
	3.1.5 Assess employment effects of mitigation measures	Have the employment effects of mitigation measures, e.g. job creation and loss, been assessed?	
	3.1.6 Assess the effects of mitigation measures on human capital (e.g., skills requirements), education systems, and other aspects of labor market)	Have the human capital needs of mitigation measures, including skills needs, and the potential of education systems to address those needs, been analyzed?	
	3.1.7 Integrate employment assessments and targets into climate plans and strategies	Have employment assessments and targets been integrated into climate plans?	
	3.1.8 Quantify the effects of mitigation measures on trade and balance of payments	Have the effects of mitigation measures on trade and the balance of payments been assessed?	
Stage 3.2 Adaptation	3.2.1 Assess how adaptation measures reduce economic losses and damages	Have the reduced economic losses and damages from adaptation measures been assessed?	
	3.2.2 Estimate the costs and investment requirements for adaptation measures	Have the costs of adaptation measures been estimated using relevant cost data?	
	3.2.3 Assess the impacts of adaptation measures on human capital and labor markets	Has the effect of adaptation measures on employment opportunities been assessed?	
	3.2.4 Identify and assess synergies and co-benefits between mitigation and adaptation	Have the synergies and co-benefits between mitigation and adaptation action been assessed?	
	3.2.5 Analyze costs and benefits from gender equality and social inclusion perspective	Have costs and benefits of adaptation measures been analyzed, considering gender equality and social inclusion aspects?	

Stage 3.3 Loss and Damage	3.3.1 Quantify climate-sensitive economic risks, losses, and damages	Does the assessment quantify climate-related economic risks, losses, and damages, considering both modeling and non-modeling approaches?	
	3.3.2 Quantify financial implications of climate-induced losses and damages	Does the assessment quantify climate-induced financial losses?	
	3.3.3 Identify and prioritize interventions to avert, minimize, and address economic L&D	Have the actions to improve governance, secure international funding, and address economic losses while aligning with local and global goals been prioritized?	
Stage 4 Finance	4.1 Estimate financial resources required to implement planned climate action	Does the climate plan or strategy estimate the financial resources required to implement planned mitigation and adaptation actions?	
	4.2 Estimate current finance flows for climate actions	Does the estimation of current finance flows for climate action identify and differentiate sources (public/private/blended, domestic vs. international), types, and sectors?	
	4.3 Plan financing low-carbon investment in line with sustainable debt, price stability, and considerations of the cost of capital	Does the financing plan for low-carbon investment align with sustainable debt and price stability?	
	4.4 Assess the climate finance gap and climate finance environment	Has the climate finance gap been assessed, and climate finance environment evaluated?	
	4.5 Identify (climate) finance sources that could be leveraged to close the gap	Did you identify potential finance sources to close the finance gap?	
	4.6 Use quantified co-benefits to prioritize investments in key economic sectors	Does the climate plan or strategy prioritize investments based on quantified co-benefits and financial returns?	
	4.7 Analyze the use of fiscal and regulatory policies to provide incentives to economic actors and generate revenues to implement climate action	Has the use of fiscal and regulatory policies to incentivize green investments and generate revenues for climate action been assessed?	
Stage 5 Implementation and Monitoring	5.1 Allocate resources required to implement climate action	Have financial and technical resources been allocated to implement climate plans and strategies?	
	5.2 Integrate climate (e.g. NDC/ LT-LEDS) finance plan into macroeconomic framework	Has the climate finance plan been integrated into the country's macroeconomic framework, considering its economic effects on fiscal and monetary policies?	
	5.3 Integrate climate strategies and plans into the country's budgeting process	Have climate plans and strategies been integrated into the country's budgeting process?	
	5.4 Allow climate plan implementation to adapt to evolving economic circumstances	Is climate plan implementation flexible enough to respond to changing economic circumstances, such as shifting funds or timelines due to unforeseen events?	
	5.5 Develop integrated climate and economic development monitoring and evaluation	Is an integrated climate and economic development monitoring and evaluation system in place to track climate investments?	

Source: Developed by authors.

Annex II: Tiered analytic roadmaps reflecting diverse countries' considerations

BOX 20 Indicative tiered analytic roadmaps for integrating climate and economic planning, considering the varying levels of resources, data availability, and technical expertise in a country

The integration of macroeconomic analysis into climate planning must be tailored to each country's resources, data availability, and technical expertise The proposed tiered framework enables any country, regardless of its capacity, to integrate climate and economic planning and to advance its analytical capacity over time.

Tier 1 - Countries with limited financial and human resources and technical capacity.

This entry-level approach focuses on integrating readily available information to ensure climate plans are economically grounded without requiring advanced modeling.

1. Stakeholder coordination: Establish basic inter-ministerial coordination, particularly between the Ministries of Finance and Economy. Stakeholder coordination should be leveraged to obtain reliable data for future analysis and align priorities.

2. Technical analysis: Prioritize minimal viable analysis and employ high-level analytical tools such as Marginal Abatement Cost Curves (MACCs) for mitigation or qualitative assessments and stakeholder consultations to identify co-benefits and risks.

BOX 20 Indicative tiered analytic roadmaps for integrating climate and economic planning, considering the varying levels of resources, data availability, and technical expertise in a country (cont.)

3. MRV system: Should collect and review existing economic data and past climate loss records. MRV systems should be leveraged to track basic economic co-benefits, such as job creation in renewable energy projects or reduced import bills from energy efficiency measures. This involves integrating simple, quantifiable economic indicators into existing climate project reporting, often using direct measurement and standardized reporting templates to ensure feasibility without overburdening systems.

Tier 2 - Countries with moderate capacity.

At this level, countries could begin developing preliminary climate finance assessments by estimating investment needs and mapping current financial flows, thereby integrating climate finance needs with other development finance needs. These assessments should be supported by stronger cross-sectoral working groups and more detailed data collection.

1. Stakeholder coordination: Focus on formalizing a structured engagement process that can be leveraged to update climate, financial, and economic information systemically. Implement cross-sectoral working groups to allow detailed data collection.

2. Technical analysis: This includes conducting systematic Cost-Benefit Analyses (CBA) for key interventions, utilizing Input-Output Analysis or Social Accounting Matrices to assess employment impacts, and employing regression-based methods or integrating basic climate damage functions into sectoral planning to evaluate adaptation benefits.

3. MRV system: Should systematically link climate expenditures in national budgets with outcomes, verifying the economic returns on climate investments. This involves more sophisticated reporting that tracks both public and private financial flows for climate action and connects them to macroeconomic indicators like sectoral GDP and employment rates, enabling a more robust analysis of the climate-economy nexus.

Tier 3 - High-capacity countries.

Countries with substantial capacity should systematically advance the integration of climate and economic planning by strengthening stakeholder coordination, deepening technical analysis on climate-finance linkages, and enhancing MRV systems.

1. Stakeholder coordination: Establish high-level inter-ministerial committees—led by the Ministries of Finance and Environment and including central banks, private sector representatives, and observers from civil society—to align climate strategies with fiscal and monetary policies.

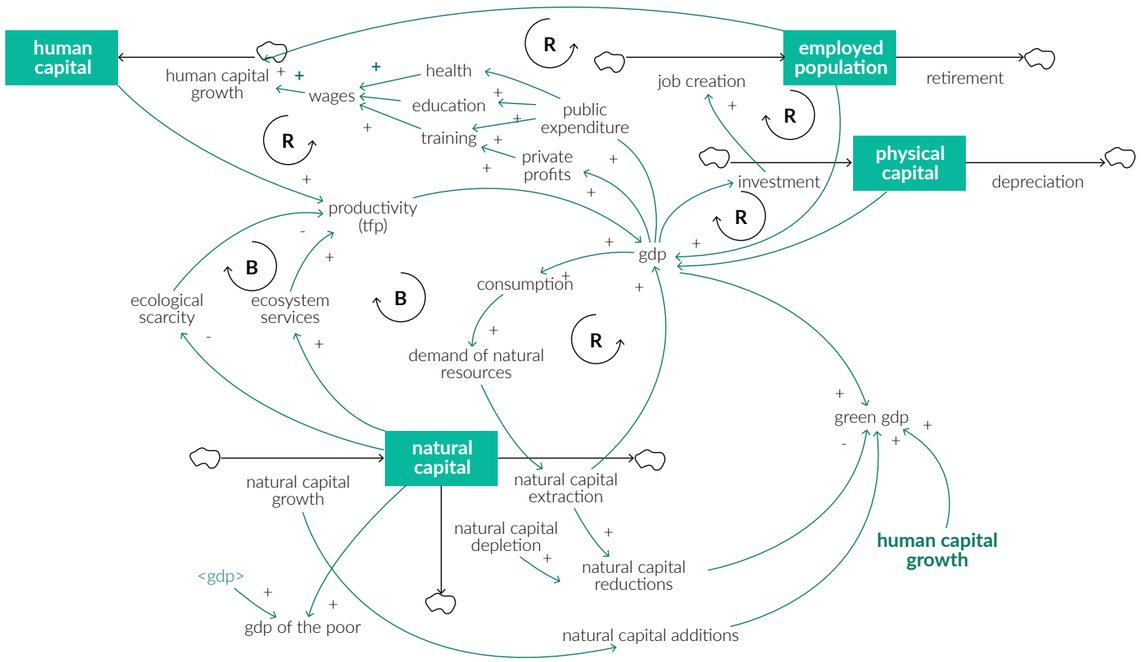
2. Technical analysis: Employ own advanced macroeconomic models, such as dynamic Stochastic General Equilibrium (DSGE) or Computable General Equilibrium (CGE) models. This enables a dynamic, economy-wide assessment of climate interventions, capturing complex feedback loops between climate action, GDP, employment, fiscal stability, and trade. Develop detailed, stock-flow-consistent financial plans to ensure climate investments align with macroeconomic stability and conduct comprehensive fiscal analyses to design carbon pricing or subsidy reform. This elaborate roadmap supports the creation of a fully integrated, evidence-based climate strategy that is both financially viable and aligned with long-term economic development goals.

3. MRV- System: Develop an integrated digital MRV platform that tracks both greenhouse gas reductions and socioeconomic indicators—such as green job creation, investment flows, and fiscal revenues—enabling real-time policy adjustment and transparent reporting.

Annex III: Tools and methods for integrating climate and economic analysis and planning

TOOL 1. THE GREEN ECONOMY MODEL (GEM)	
High level of complexity	**High level of data requirements**
Objective: Understand broader economic effects of NDC scenarios, e.g. on GDP, employment, government revenue, and investment flows, and possible trade-offs, co-benefits, and cost-effectiveness of measures, in order to prioritize actions that maximize economic growth.	
Scope of Modeling: Define the GEM's scope, including key macroeconomic variables such as GDP, land use, and emissions, and develop causal-loop diagrams (CLDs) to reflect interrelations. Engage stakeholders and experts to finalize priority sectors, variables, and indicators. Data Collection: Collaborate with national officials to gather the data required and supplement them with national statistics or international sources. Collect sectoral and climate intervention data to support building alternative scenarios. Model Creation, Parameterization, and Calibration: Translate the CLDs into a mathematical model with equations and numerical inputs. Include key macroeconomic indicators and sectoral data defined in previous steps. Development of BAU Scenario: Construct sectoral BAU trajectories based on current policies and trends, without additional mitigation and adaptation measures. The GEM can either incorporate outputs from existing sectoral models or include sector-specific modules. Creation of Alternative Scenarios: Consult stakeholders to identify and validate low-carbon and climate resilience interventions. Develop alternative low-emission and climate resilient scenarios and assess them for cost-benefits and co-benefits at both the sectoral and economy-wide levels. Stakeholders and Experts Inputs: Throughout an iterative process, refine scenario assumptions, select climate interventions, set emission reduction targets, and analyze scenario results, etc., through close consultations with relevant stakeholders and experts to ensure ownership, relevance, and accuracy.	

Figure 13 Causal loop diagram that represents the principal macro-level variables and feedback loops at the general and aggregate level of the GEM



TOOL 2. COST-BENEFIT ANALYSIS (CBA)

Low level of complexity | **Moderate level of data requirements**

Objective: Understand the cost-benefit ratio of low-carbon interventions in the NDC or LT-LEDS as well as support prioritization of interventions, if financial resources are limited. The CBA can be conducted as a stand-alone exercise or as an integrated feature of GEM. Benefits can be financial and non-financial and can accrue to investors directly and/or to society. As the CBA faces limitations in estimating social and non-monetary benefits, qualitative expert judgment should always accompany it.

TOOL 3. EMPLOYMENT IMPACT ASSESSMENTS (EMPIAS)

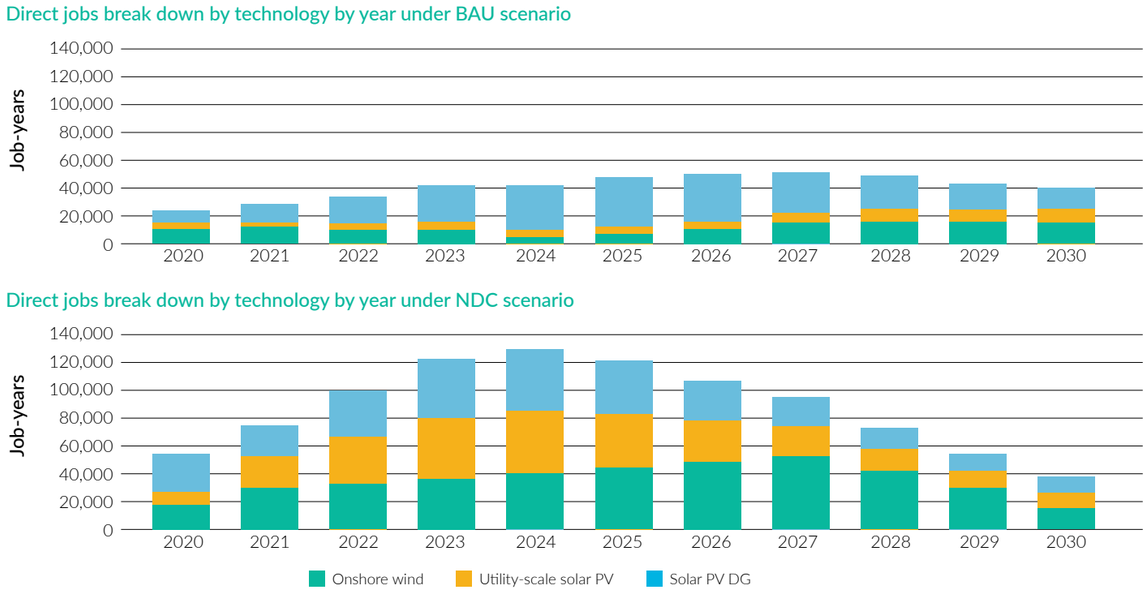
Moderate level of complexity | **High level data requirements**

Objective: Employment Impact Assessments (EmpIAs) measure both the quantitative and qualitative employment effects of climate policies. The gross or net number of green jobs created is usually calculated for quantitative employment impacts of NDCs or LT-LEDS. Human capital skills gaps are measured for a qualitative assessment.

The assessment can use economic model-based estimates or a top-down approach. The methodologies for top-down employment estimations include Input-Output Analysis (IOA), Social Accounting Matrix (SAM), Local employment multipliers, etc.

Example: GGGI's study "Employment Assessment of Renewable Energy" focuses on the employment effects of reaching the renewable energy targets of the NDCs of Indonesia, Rwanda and Mexico. The study combines input-output assessment methods with value chain analysis to determine the number of jobs created under each country's existing power sector scenarios up to 2030. The results are disaggregated by value chain stages per renewable energy technology, by type of human resource or occupation and by skill level. The study assesses potential occupations and skills gaps by analyzing existing relevant education programs and graduation rates. It also compares geographical locations where renewable energy jobs are likely to be created with the locations of training and vocational programs. Finally, the study provides policy recommendations for local transition plans on skills and training, social protection, layoffs, engagement with unions, etc.

Figure 14 Direct jobs that renewable energy technologies created under different scenarios in Mexico



Source: GGGI, 2020.

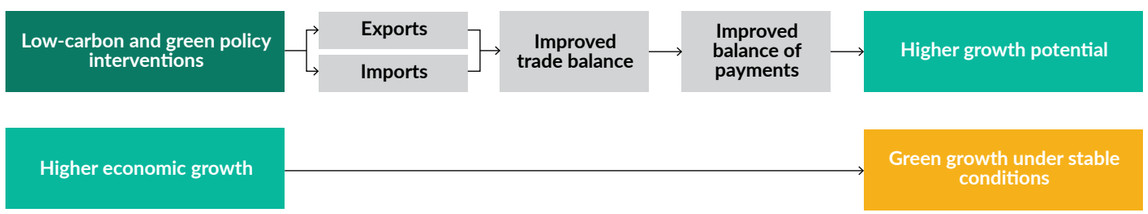
TOOL 4. BALANCE-OF-PAYMENTS ANALYSIS

Moderate level of complexity | **Moderate level of data requirements**

Objective: Assess the NDC's effect on the trade balance and the balance of payments to inform its feasibility and financial implementation planning. The NDC implementation can strengthen a country's external position and generate economic resources. If NDC implementation improves the trade balance and thereby the balance of payments, foreign currency availability increases.

To understand how implementing the NDC affects the trade balance, the balance of payments and the pattern of foreign debt, the respective change in the growth potential of the country is compared with the change in actual economic growth (see **Figure 15**).

Figure 15 The role of the balance of payments in the NDC



TOOL 5. ADAPTATION ANALYSIS

High level of complexity **High level of data requirements**

Objective: Assess how adaptation actions reduce economic loss and damage by quantifying their costs and benefits. This can help prioritize interventions that reduce adverse effects and risks while improving economic stability.

Figure 16 The procedure of the climate adaptation analysis

1. Identify key sectors and climate risks: Review existing national strategies and policy documents or conduct a rapid climate risk assessment, using historical climate data and projections to identify the priority sectors in the country.
2. Select appropriate models: Make sure that the model is consistent with the expertise and tools established already within the relevant institutions. Using more sophisticated tools with greater data and technical requirements can help build the expertise. However, if resources are limited or results are a priority, simpler models (e.g. regression-based) may be more appropriate.
3. Integrate climate data and projections: Use statistical methods, i.e. regression analysis, to estimate the relation between past climate trends and sectoral outputs. This allows quantitative estimates of climate impact by establishing historical relations between climate variables (e.g., temperature, precipitation) and sector-specific outcomes (e.g., crop yields, energy demand).
4. Model sectoral and economy-wide effects: Define a BAU pathway without accounting for climate effects and compare it with a scenario in which climate effects are integrated.
5. Develop adaptation scenarios: Model a climate-resilient scenario with adaptation measures (identified in Step 1) and compare the outcomes to scenarios that incorporate climate impacts without adaptation measures.
6. Interpretation of the results of scenarios: Interpret the results comparing key indicators such as GDP, sectoral outputs, employment, and climate damage across scenarios.

Adaptation actions can also be assessed using CBA, which compares the costs of implementing these actions against the benefits of avoided losses and enhanced resilience.

TOOL 6. IDENTIFYING SYNERGIES AND CO-BENEFITS OF MITIGATION AND ADAPTATION ACTIONS

Low level of complexity **Low level of data requirements**

Objective: Design integrated, cost-effective strategies that deliver broader environmental, social, and economic benefits, enhancing the effect of climate policies overall. Assessing synergies and co-benefits between mitigation and adaptation actions helps maximize resource efficiency and achieve multiple climate goals simultaneously while minimizing trade-offs.

MITIGATION STRATEGY	ADAPTATION SYNERGY	ADAPTATION TRADE-OFF
Option 1		
...		

ADAPTATION STRATEGY	MITIGATION SYNERGY	MITIGATION TRADE-OFF
Option 1		
...		

The table provides a structured approach to evaluating adaptation synergies and trade-offs associated with mitigation actions, and vice versa, allowing stakeholders to integrate this into sectoral and economy-wide planning. It is based upon principles from IPCC's "Special Report on the effects of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways".

TOOL 7. ESTIMATING CLIMATE-INDUCED ECONOMIC L&D AND PRIORITIZING L&D INTERVENTIONS

High level of complexity **High level of data requirements**

Objective: Include elements of L&D in climate strategies such as the NDC, in order to identify gaps and support planning, funding access, and effective L&D-related projects.

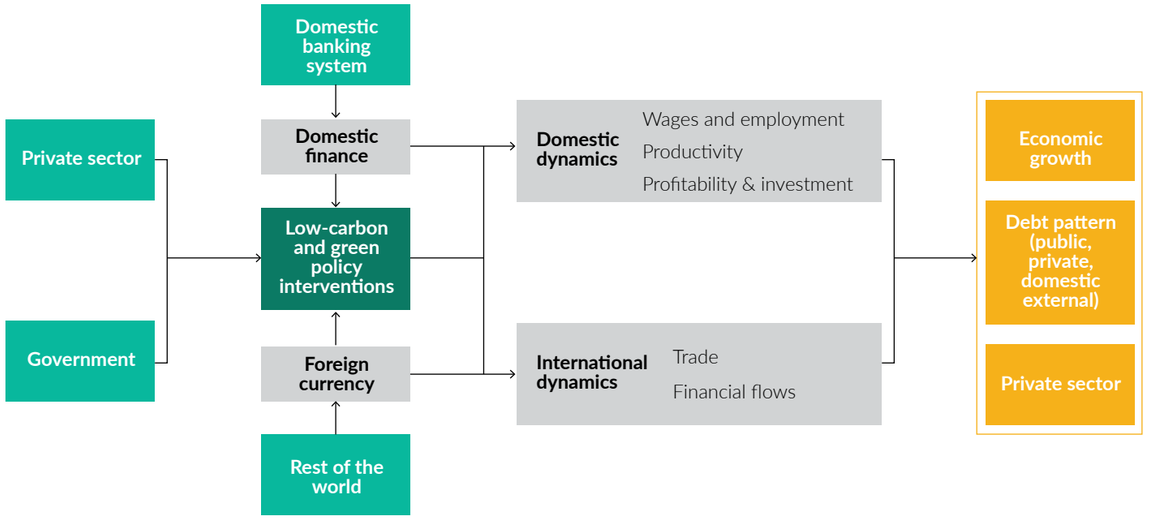
1. Quantify climate-sensitive economic risks, losses, and damages: A robust assessment process should combine modeling and non-modeling methods to capture both quantitative and qualitative dimensions of climate risks. Sectoral models can be combined with macroeconomic ones. Models such as GEM or CGE quantify sectoral losses' cascading effects on GDP, employment, and public revenues. Insights from stakeholder surveys can refine model assumptions.
2. Quantify L&D's financial implications: Financial implications of climate-related losses include reductions in income, shifts in public spending, or increased budgetary demands for disaster recovery and social safety nets. System dynamics-based tools like GEM can model these effects to forecast financial risks, identify financing gaps, and design fiscal policies that balance building resilience with economic stability.
3. Prioritize interventions to address L&D: A combination of technical analyses, such as CBA, MCDA, and scenario modeling, with participatory processes can ensure relevance and inclusivity when identifying priority interventions to address climate-induced L&D.

TOOL 8. FINANCIAL PLANNING

High level of complexity **High level of data requirements**

Objective: Analyze how a country can finance its NDC/LT-LEDS consistent with macroeconomic stability in terms of economic growth, sustainable public debt, stability of foreign exchange and external debt, as well as low inflation. Securing the financial means for climate policy implementation requires different types of finances, i.e. foreign and domestic as well as public and private. GGGI's stock-flow-consistent (SFC) model links foreign, domestic, public, and private finances together with economic dynamics. The SFC modeling approach is flexible and can accommodate up to more than 100 modeling equations depending upon the analysis's level of detail.

Figure 17 Domestic and external economic dynamics of low-carbon interventions



TOOL 9. ESTIMATION OF CLIMATE FINANCING GAP

Low level of complexity **Low level of data requirements**

Objective: Estimate the country's climate financing gap to inform the development of a climate finance strategy to implement the LT-LEDS, NDC, and NAP while reducing the dependence on international finance and promoting new financial mechanisms such as the development of carbon markets, green bonds, etc. GGGI combines a needs assessment with finance tracking to identify financing gaps for different policy scenarios in four steps:

1. The necessary financial resources to achieve specific mitigation or adaptation goals are estimated using the GEM and CBA.
2. Current and historic climate financial flows at the national level are tracked using national budget data, as well as data from international databases such as the Climate Policy Initiative (CPI) or the Organization for Economic Cooperation and Development (OECD). Forecasts of climate financial flows are estimated based on historical data.
3. A sensitivity analysis on the financing gap estimations is performed to account for uncertainties and risks associated with regulatory and policy changes or economic factors that can increase or decrease financial flows.
4. Finally, suitable climate finance instruments and methods are identified for conditional and unconditional targets as well as for mitigation and adaptation activities.

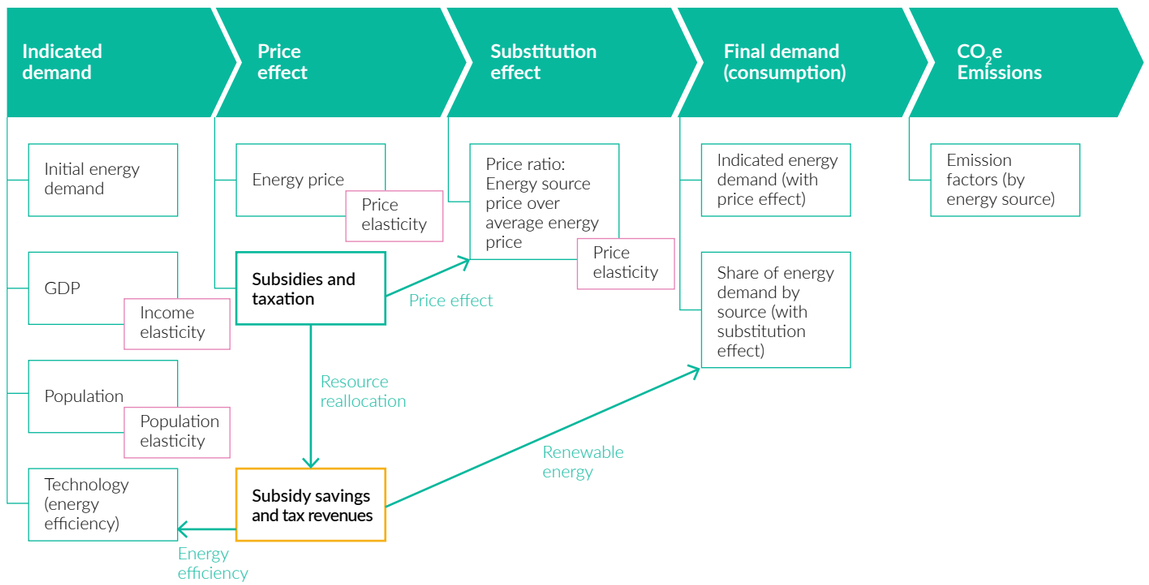
TOOL 10. FISCAL ANALYSIS

Moderate level of complexity **Moderate level of data requirements**

Objective: Assess the effects of fossil fuel subsidy reform and carbon pricing policies on energy demand, fuel substitution, carbon emissions, and public revenues.

Fiscal analysis is based on the System Dynamics-based partial equilibrium model with calibration supported by econometric analysis (Gerasimchuk et al., 2017; GSI, 2019). The model forecasts energy demand and related emissions. The fiscal analysis model projects national energy consumption by sector and source and its main structural assumptions are demonstrated in **Figure 18**. The model allows estimating the effect of fiscal policies on energy consumption and on GHG emissions. It also compares such reductions to other potential intervention options (e.g., investments and/or mandates on energy efficiency and renewable energy).

Figure 18 The economics of green fiscal policies



The Global Green Growth Institute

19F Jeongdong Building, 21-15, Jeongdong-gil,
Jung-gu, Seoul, Korea 04518

Follow our activities on Facebook, X, LinkedIn, YouTube and Instagram.

www.GGGI.org