



EASTERN AND
SOUTHERN AFRICA

ETHIOPIA

World Bank Group

COUNTRY CLIMATE AND DEVELOPMENT REPORT

February, 2024

© 2023 The World Bank Group
1818 H Street NW, Washington, DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

This work is a product of the staff of The World Bank Group with external contributions. “The World Bank Group” refers to the legally separate organizations of the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA), the International Finance Corporation (IFC), and the Multilateral Investment Guarantee Agency (MIGA).

The World Bank Group does not guarantee the accuracy, reliability or completeness of the content included in this work, or the conclusions or judgments described herein, and accepts no responsibility or liability for any omissions or errors (including, without limitation, typographical errors and technical errors) in the content whatsoever or for reliance thereon. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of the World Bank Group concerning the legal status of any territory or the endorsement or acceptance of such boundaries. The findings, interpretations, and conclusions expressed in this volume do not necessarily reflect the views of the organizations of the World Bank Group, their respective Boards of Executive Directors, and the governments they represent.

The contents of this work are intended for general informational purposes only and are not intended to constitute legal, securities, or investment advice, an opinion regarding the appropriateness of any investment, or a solicitation of any type. Some of the organizations of the World Bank Group or their affiliates may have an investment in, provide other advice or services to, or otherwise have a financial interest in, certain of the companies and parties named herein.

Nothing herein shall constitute or be construed or considered to be a limitation upon or waiver of the privileges and immunities of any of the organizations of The World Bank Group, all of which are specifically reserved.

Rights and Permissions

The material in this work is subject to copyright. Because The World Bank Group encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for non-commercial purposes as long as full attribution to this work is given and all further permissions that may be required for such use (as noted herein) are acquired. The World Bank Group does not warrant that the content contained in this work will not infringe on the rights of third parties, and accepts no responsibility or liability in this regard. All queries on rights and licenses should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; e-mail: pubrights@worldbank.org.

Editing: Chandrahas
Choudhury Photo Credit:

World Bank Collection Editorial

Credit: Ha Doan

Designed By: Roots Advertising Services



ETHIOPIA

COUNTRY CLIMATE AND
DEVELOPMENT REPORT

Contents

Acronyms	6
Acknowledgements	8
Executive Summary	10
Priority 1: Accelerate implementation of structural reforms and promote social safety net programs	16
Priority 2: Invest in climate-resilient infrastructure	16
Priority 3: Support greater decentralization of climate response	17
1. Climate-Related Risks and Opportunities for Development	21
1.1 Development context	22
1.1.1 Weakening economic performance	22
1.1.2 A stalled structural transformation	23
1.1.3 An ambitious reform agenda	26
1.1.4 Addressing development needs amidst conflict and inflation	26
1.2 Increasing risks from climate change	27
1.2.1 High impacts of natural hazards	27
1.2.2 Increasing climate variability and uncertainty under climate change	28
1.2.3 Climate change could threaten development goals	29
1.3 Challenges and opportunities of a green transition	30
2. Climate Change Commitments on Mitigation and Adaptation	32
2.1 Climate change targets and commitments	33
2.2 The legal framework for climate action	33
2.3 Policies, strategies, plans for mainstreaming climate action	35
2.4 Institutional structure for implementation and coordination	36
2.4.1 Climate change institutional and governance structures	37
2.4.2 Localization of the climate change agenda	37
2.4.3 Monitoring of climate change	38
2.5 Mainstreaming climate change into public expenditure management	38
2.5.1 Integrating climate into budget management	38
2.5.2 Climate change in intergovernmental fiscal transfers	39
2.5.3 Climate in public investment and expenditure management	40
2.5.4 Public accountability for climate expenditure	41

3. Sectoral Implications of Climate Change in Ethiopia	42
3.1 Coping with climate impacts on water and land.....	43
3.2 Making agriculture more productive and climate-resilient	47
3.3 Making energy, transport, digital, and cities more climate-resilient.....	51
3.4 Diversify the economy by tapping into mining and tourism opportunities	57
3.5 Protecting and leveraging human capital for climate action	59
3.6 Low-carbon development opportunities	61
4. Macroeconomic and Poverty Implications of Climate Change.....	64
4.1 Climate change and Ethiopia's future growth.....	65
4.1.1 Macroeconomic and poverty impacts of climate change.....	65
4.1.2 Poverty and distributional impacts of climate change.....	68
4.2 Fiscal considerations in managing climate change impacts	69
4.2.1 Structural reforms are critical to expand fiscal space	71
4.2.2 Enabling the private sector	72
4.2.3 Managing residual risks.....	74
4.2.4 Mobilizing external and blended finance: options for Ethiopia.....	75
4.3 Supporting the most vulnerable.....	77
5. Priority Policy Actions and Investments	79

Acronyms

10YNDP	10 Years National Development Plan
ADLI	Agriculture Development Led Industrialization
AfCFTA	African Continental Free Trade
Area AFR100	African Forest Land Restoration
Initiative BAU	Business as usual
CALM	Climate Action through Landscape Management
CBT	Climate Budget Tagging
CERs	Certified emissions reductions
CMIP6	Coupled Model Intercomparison Project Phase 6
CRGE	Climate Resilient and Green Economy
DAC	Development Assistance Committee
DNS	Debt-for-nature swap
DRF	Disaster Risk Financing
EDRMC	Ethiopia Disaster Risk Management Commission
EIA	Environmental Impact Assessment
EIH	Ethiopian Investment Holdings
EPA	Environmental Protection Authority
EPRP	Emergency Preparedness and Response Program
EPSE	Ethiopian Petroleum Supply Enterprise
ESIA	Environmental and Social Impact and
Assessment ESMP	Environmental and Social
Management Plan	FDRE
of Ethiopia	Federal Democratic Republic
FPPA	FDRE Public Procurement and Property Authority
FPU	Food Production Unit
FX	Foreign exchange
GCF	Green Climate Fund
GCM	Global Circulation Model
GHG	Greenhouse gas
GoE	Government of Ethiopia
GTP	Growth and Transformation Plan
HGERA	Home Grown Economic Reform Agenda
H-NAP	National Health Adaptation Plan to Climate Change
HoF	House of Federation
HSTP	Health Sector Transformation Plan
ICT	Information and Communications Technology
IDPs	Internally displaced persons
IFMIS	Integrated Financial Management Information System
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IPP	Independent Power Producer
LIC	Lower-income country
LT-LEDS	Long-Term Low Emissions Development Strategy
LUCF	Land Use Change and Forestry
M&E	Monitoring and Evaluation
MCRP	Mine Closure and Rehabilitation Plan
MFI	Microfinance
MFMod	World Bank Macro Fiscal Model

MinT	Ministry of Innovation and Technology
MoF	Ministry of Finance
MoH	Ministry of Health
MoIL	Ministry of Irrigation and Lowlands
MoPD	Ministry of Planning and Development
MoWE	Ministry of Water and Energy
MRV	Monitoring, Reporting and Verification
MtCO ₂ e	Million tonnes (metric tons) of carbon dioxide equivalent
MW	Megawatt
NAP	National Adaptation Plan
NBE	National Bank of Ethiopia
NAPA	National Adaptation Programme of Action
NDC	Nationally Determined Contribution
NGFS	Network for Greening the Financial System
NPV	Net Present Value
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OFAG	Office of the Federal Auditor-General
OFWE	Oromia Forest and Wildlife Enterprise
PBA	Performance-based allocation
PCN	Project Concept Note
PEHAA	Public Enterprises Holding and Administration Agency
PIM	Public Investment Management
PPA	Policy and Performance Action
PPP	Public-Private Partnership
PSNP	Productive Safety Net Program
PW	Public Works
REGREP	Ethiopia Renewable Energy Guarantees Program
RSF	Resilience and Sustainability Facility
SDG	Sustainable Development Grant
SNNP	Southern Nations, Nationalities, and People
SLB	Sustainability-linked bond
SLM	Sustainable Land Management
SMEs	Small and Medium Enterprises
SOE	State-Owned Enterprise
SSA	Sub-Saharan Africa
SSP	Shared Socioeconomic Pathway
STMP	Sustainable Tourism Master Plan
tCO ₂ E	Tonnes (metric tons) of carbon dioxide equivalent
TWh	Terawatt hours
UCT	Upper credit tranche
UHC	Universal Health Coverage
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary carbon market
VCS	Verified Carbon Standard
VERS	Verified emissions reductions
VRE	Variable renewable energy
WASH	Water, sanitation and

hygiene All dollar amounts are US

dollars.



Acknowledgements

The Ethiopia Country Climate and Development Report (CCDR) captures the interplay between development, climate change and climate policies. This report was developed by individuals across the World Bank Group (WBG), in coordination with the Government of Ethiopia (GoE), to promote sustainable and resilient development in the face of climate change.

The preparation of the report was co-led by Urvashi Narain (Lead Economist, SAE3), Tehmina Khan (Lead Economist/Program Leader, EAEDR), Tewodros Dessie (Economist, CAFCE) and Ulf Narloch (*Former-TTL*, Senior Environmental Economist, World Bank). Key contributions were made by Lulit Beyene (Senior Economist, EMFMD), Katherine Polkinghorne (Climate Change Economist/Consultant, SAE2), Brent Boehlert (Principal Environmental Economist/Consultant), Kenneth Strzepek (Land-Water Modeling Specialist/Consultant), Adrian Leigh Vogl (Land-Water Modeling Specialist/Consultant, SENGL), and Jorge Eduardo Leon Sarmiento (Land Modeling Specialist).

We are grateful for the overall guidance from Ousmane Dione (Country Director, AECE3), Hiroyuki Hatashima (Chief Evaluation Officer, MIGES) and Mary Peschka (Director, CAEDR), Iain Shuker (Regional Director, Sustainable Development), Jumoke Jagun-Dokunmu (Regional Director for Eastern Africa, IFC), Merli Margaret Baroudi (Director, MIGES), Ayat Soliman (Regional Director, Africa East and South), Madalo Minofu (Country Manager, CAET), Stephan Dreyhaupt (Principal Economist, CAFCE), Marco Hernandez (EAEM2), David Lord (Program Leader SAEDR), Xiaoping Wang (Program Leader, IAEDR), and Suleiman Namara (Lead Social Protection Specialist, HAES1).

The team also wishes to thank peer reviewers Kevin Carey (Advisor, EMFDR), Ellysar Baroudy (Lead National Resources Management Specialist, SAWE1), Vikas Choudhary (Senior Agricultural Specialist, SEAAG), Pravin Karki (Senior Hydropower Specialist, IEEGK), and Volker Treichel (Principal Economist, IFC) and Szilvia Doczi (Senior Energy Economist, IECDR) for their constructive and valuable inputs.

Thank you to our sector experts and colleagues from the wider CCDR team which includes the following. Key sector modelling: Tim Thomas (CGIAR), Yohannes Daniel (IFPRI), Faaqa Hartley (IFPRI) and Mr Solomon Feleke (Consultant). Sustainable Development: David Malcolm Lord (Lead). Administrative support: Esther Bea (Program Assistant, SAE2), Etsubdink Tesfaye (Team Assistant, AECE3) and Alemshet Degu (Assistant, AECE3). Agriculture: Elliot Mghenyi (Lead), Jeren Kabayeva, Assaye Legesse, Esayas Gebremeskel, Welela Ketema, Hayalsew Yilma, Biruktayet Betremariam, Shijie Yang. Water: Habab Taifour (Lead), Iain Menzies, Laura Bonzanigo, Wendwosen Feleke, Yohannes Fisseha, Amanuel Woldetsadik, Antonio Rodriguez Serrano, Diego Rodriguez. Environment, Natural Resources, and Blue Economy: Ross Hughes (Lead), Shewakena Abab, Hailu Ayele, Elisson Wright, Million Gizaw, Dawit Mulatu. Urban, Disaster Risk Management, Resilience and Land: Martin Onyach-Olaa, Dinkneh Tefera, Lukas Loeschner, Ko Takeuchi, Mercedes Stickler, Harum Mukhayer. Social Sustainability and Inclusion: Mariko Yamamoto (Lead), Andrew Roberts, Gibwa Kajubi, Simon Sottas, Yalemzewud Tiruneh, Samuel Demsash, Matthew Stephens. Energy: Mikul Bhatia (Lead), Xiaoping Wang, Abdulhakim Abdisubhan, Kenta Usui, Wendayehu Demissie Tekalign, Maria Arango. Extractives: Martin Lokanc. Transport: Yi Yang

(Lead) Fang Xu, Getachew Debela, Digital: Victor Kyalo (Lead), Tim Kelly, Lamia Naji. Education: Ademe Zeyede Hailu (Lead). Health: Roman Tesfaye (Lead), Enias Baganizi, Tseganeh Guracha, Tewodros Tesemma. Social Protection and Jobs: Belay Addise (Lead), Suleiman Namara, Ayuba Hussein, Ian Campbell. From the Economic Growth, Finance, and Institutions teams this includes Macroeconomics, Trade and Investment: Vinayak Nagaraj, Samuel Mulugeta, Mohammad Khabbazan, Poverty and Equity: Obert Pimhidzai (Lead), Cesar Cancho, Wondimagegn Tesfaye, Daniel Valderrama. Finance,

Competitiveness & Innovation: Mengistu Achew (Lead), Senidu Fanuel, Bisrat Mekonnen, Marlon Rawlins, Evie Calcutt. Governance: Rafika Chaouali (Lead), Anjani Kumar, Abiy Belay, Jay-Hyung Kim, Lobna Ahmed, Shrikant Baldi. Legal: Remi Moncel (Co-lead), Christine Makori (Co-lead), Navya Jannu. Communications: Gelila Woodeneh, Zena Demissie. We are also grateful for the guidance from Jules Leichter (IMF), Jessica Wade (MIGA), Moritz Nebe (MIGA) and Memory Machingambi (IFC). Fragility, Conflict and Violence (FCV) experts: Mohamed Abdel-Razig, Lindsey Jones, Joanna Turner (IFC), Hannah Blyth (IFC) and Amira Mekonen (IFC). Editing and inputs: Professor Sudhir Shetty (Former Chief Economist for EAP/Consultant).

The team would like to thank colleagues of GoE who provided guidance and technical inputs to this work. In particular, the focal points from Ministry of Planning and Development (MoPD)— Mr Abas Mohammed (CEO for Climate Change), Ministry of Finance (MoF) and Mr. Abebe Tadesse (Director, International Financial Institutions Directorate). Additionally, guidance from the Ministry of Agriculture (MoA), Ministry of Health (MoH), Ministry of Industry (Mol), Ministry of Transport and Logistics (MoTL), Ministry of Urban and Infrastructure (MoUI), Ministry of Water and Energy (MoWE), and Ethiopian Road Administration (ERA) contributed to the alignment of this document with the GoE climate and development objectives and is gratefully acknowledged.

The report benefited from key studies on natural capital and climate finance where funding was provided by the Climate Support Facility (CSF) and the Climate Investment Fund (CIF), respectively. Support from the Global Program on Sustainability (GPS) resources and PROGREEN-funded Biodiversity, Ecosystem- based Landscape Assessment (BELA) initiative is also appreciated and supported modeling that informed the land management and other parts of the CCDR.



EXECUTIVE SUMMARY





Backgrou

Growing economic and social challenges threaten Ethiopia's economic success over the past two decades. Exceptional growth of over 10 percent between 2004 and 2019 placed Ethiopia among the fastest-growing economies in the world, trebling incomes per capita and contributing to a sharp reduction in poverty. But these achievements, although impressive, were underpinned by a state-led and investment-heavy growth model that contributed to macro-imbalances, a stalled structural transformation, declining external competitiveness, an acute shortage of fiscal resources and debt vulnerabilities, and increasingly limited space for the private sector to operate in. Meanwhile, development needs remain vast, amid very high levels of food insecurity, and poverty reduction has slowed in recent years due to multiple compound shocks, including the COVID-19 pandemic, Russia's invasion of Ukraine and resulting high global food and energy prices, an extended drought, and the conflict in the Tigray, region and more recently Amhara, region. In addition to heightened social fragility, such shocks have exacerbated macroeconomic fragility. Growth has fallen to about 6 percent annually; this will not be sufficient for Ethiopia to achieve its appropriately ambitious development goals, including reducing extreme poverty, which still stands at almost a quarter of the population.

Climate shocks are magnifying these challenges to growth and development. The cumulative effects of the ongoing drought — the most severe in the last 40 years with six consecutive failed or poor rainy seasons — have been devastating for people in the arid pastoral areas of Ethiopia. Simultaneously, flooding has damaged infrastructure and disrupted livelihoods in other parts of the country. Climate change in the coming decades could reduce the productivity of the agriculture sector, which currently employs about two-thirds of Ethiopia's workforce, including the most vulnerable groups in the population. By threatening food security, climate change will also likely worsen conflict within and across regions. Higher temperatures and changes in rainfall patterns could also exacerbate the incidence of diseases such as malaria and dengue, which along with likely adverse effects of heat stress will reduce labor productivity and the prospects of human capital accumulation, both critical to sustaining growth. Climate change could also damage energy, transport, and digital infrastructure needed to support the structural transformation of the economy to industry and manufacturing.

The Government of Ethiopia (GoE) has laid out an ambitious agenda to address these challenges with a focus on diversifying the economy and making it more resilient including to climate shocks. The 10 Years National Development Plan (10YNDP) defined ambitious development targets consistent with achieving a growth rate of 10 percent annually that would also help to reduce extreme poverty to 7 percent by 2030. The 2019 Home Grown Economic Reform Agenda (HGERA) identifies reforms to restore macro stability, promote private sector investment and raise productivity in key sectors. To address the threats posed by climate change, Ethiopia has articulated a Climate Resilient Green Economy (CRGE) strategy, establishing itself as a leader on climate action. The GoE has signaled its strong commitment to adaptation and has set ambitious mitigation targets, as articulated in its updated Nationally Determined Contribution (NDC) in 2021 and the Long-Term Low Emissions Development Strategy (LT-LEDS) in 2023.

The Ethiopia Country Climate and Development Report (CCDR) aims to support Ethiopia's plans to achieve its development goals within the context of a changing climate. By quantifying the likely economic impacts of climate change on the

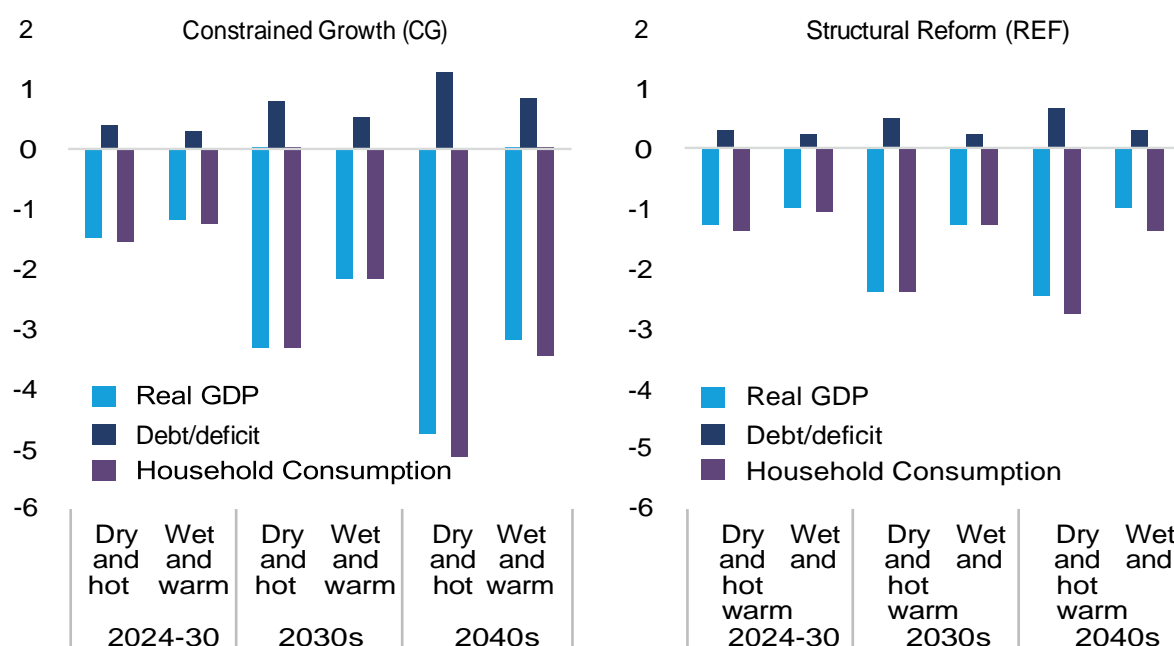
economy between now and 2050, the report highlights the measures that the GoE needs to prioritize to prepare for these impacts and adapt to them most effectively, with a particular focus on actions that should be taken throughout the remainder of this decade. Opportunities for low-carbon growth as a co-benefit of development programs are also examined.

Key

Climate change will impose large, and spatially varied, costs on the economy and people

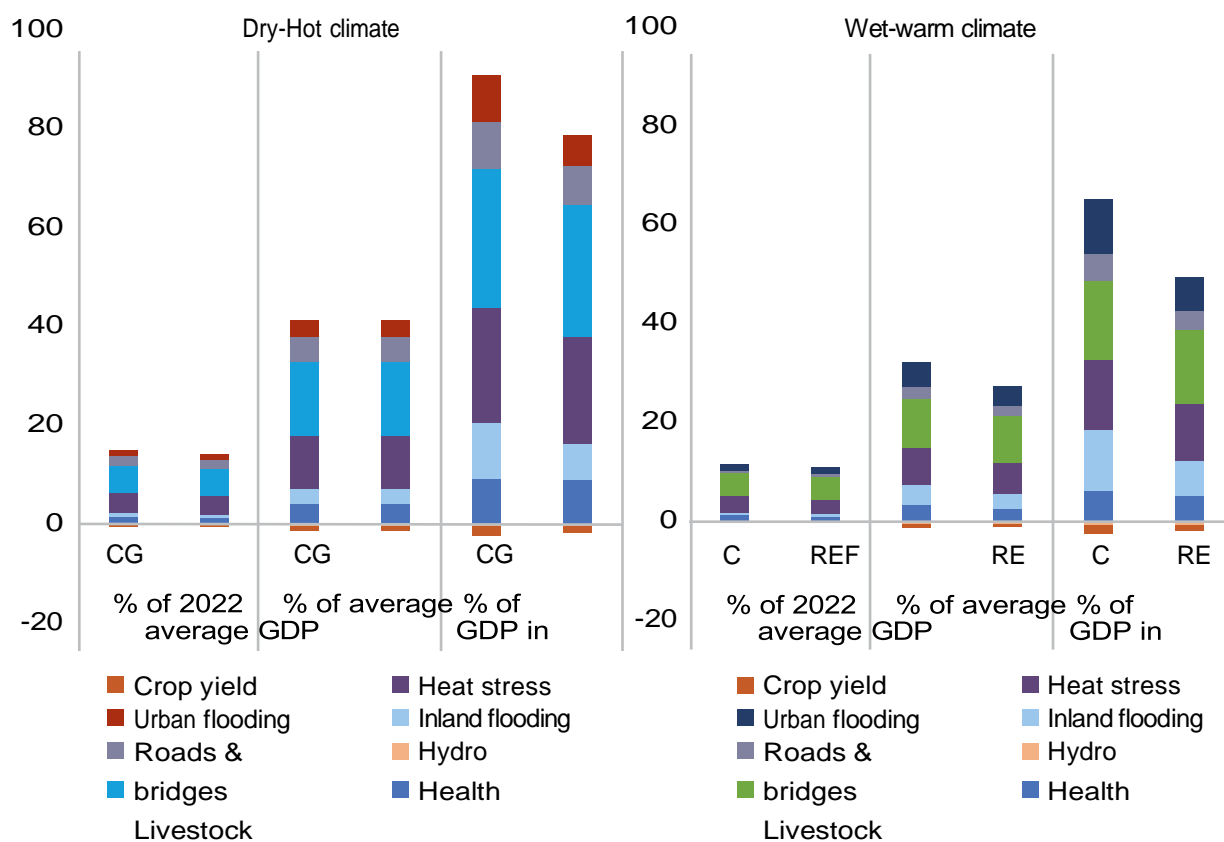
The modeling analysis done for the CCDD establishes that climate change will impose large costs on the economy and costs will increase rapidly after 2030. The analysis establishes the first set of quantitative estimates of the impact of climate change on Ethiopia's economy and shows that adverse impacts of climate change will materialize through several channels: more frequent and severe flooding; reduced crop and livestock yields; more variable hydropower production; infrastructure damage; and losses in human health and productivity. If current policies, characterized by a large state footprint on the economy and slow progress on structural reforms, are maintained, referred to as the Constrained Growth (CG) scenario, average annual losses to GDP and household consumption (relative to the baseline without a significant climate change impact) range from 1 to 1.5 percent annually in 2024-30, reaching the upper end of this range in the dry and hot climate scenario (Figure ES-1). Moreover, impacts rapidly increase from 2030 onwards, with average deviations from GDP and household consumption reaching as high as 5 percent during the 2040s. The corresponding cumulative economic loss rises from about 10 to 14 percent (of 2022 GDP) between 2023-30, to about 20 to 30 percent of average decadal GDP between 2030-40 and even more thereafter (Figure ES-2). The largest losses stem from reductions in livestock yields and from heat stress on labor productivity, followed by impacts on roads and bridges and from inland flooding. Reflecting the uncertainty of climate change impacts, magnitude of impacts will also depend on whether the resulting climate is wet and warm or dry and hot, with the adverse impacts being larger in the latter.

Figure ES-1. Annual average deviations from CG and REF baselines



yield, flooding, infrastructure, health and labor productivity) on real GDP, debt/deficit (percent of GDP) and household consumption relative to CG and REF baselines. Hot and Wet (SSP 2–4.5) scenarios only contain flooding, while Hot and Dry SSP (3–7.0) only include drought.

Figure ES-2. Cumulative economic losses by impact channel



Source: World Bank MANAGE simulations. Note: The chart shows the loss from 6 different channels of climate impact relative to CG and REF baselines. The losses are cumulated by decade over the periods 2023-30, 2031-40, and 2041-50 and shown as percent of GDP in 2022, average GDP during the 2030s, and average GDP during the 2040s respectively. A discount rate of 6 percent was used to discount future losses.

Poverty will also increase due to the impacts of climate change in the absence of macroeconomic and structural reforms. The analysis done for the CCDCR shows that climate change will lead to larger increases in poverty over the next 25 years if structural reforms are not implemented. For instance, poverty under the CG scenario would increase by between 0.5 and 1.7 percentage points by 2050, with the larger increase corresponding to the hot and dry climate scenario. At the upper end, this would be equivalent to an additional 3.7 million people living below the poverty line due to climate change impacts. In contrast, in the reform scenario (REF), with implementation of structural reforms, the increase in poverty would be much smaller -- between 0.1 and 1 percent.

The impacts of climate change are spatially varied, with larger impacts on agriculture and livestock in the lowlands. Unlike the highlands, which have been targeted by government programs to address erosion during the 1980s, Ethiopia's lowlands are under much greater threat from erosion due to increased rainfall due to climate change. By 2050, the resulting land degradation could reduce crop yields from 1 to 5 percent for different crops as nutrients are washed away with soils. Losses from climate change for livestock production are also likely to be higher in the lowlands. For instance, the Afar region, which contains the northeastern lowlands, is expected to see cattle milk production decreases of between 13 and 25 percent in the 2040s in a scenario without reforms, compared to the average decrease of between 6 and 11 percent nationally. Similarly, cattle meat production will be affected more in the lowlands, with decreases of between

4 and 14 percent in the Afar region, more than double what is expected nationally. For goat meat, of which the Afar region is the largest producer in the country, declines of between 6 and 21 percent are likely, compared to declines nationally of between 5 and 13 percent.

The impacts of climate change on poverty and their spatial differentiation could worsen social tensions and raise the risk of conflict. Climate change will worsen poverty both by increasing the number of poor and because the poor will be disproportionately exposed to climate impacts, and lack the resources to cope with them. Spatially differentiated impacts on agriculture and livestock production will increase regional inequality and risk fraying the social fabric even further, including by increasing migration, and inter-group conflict over resources like water and pastureland, especially in the lowland areas. And these pressures will add to the strains already felt across Ethiopia by its large population of internally displaced persons from years of political conflict and drought.

Structural reforms strengthen resilience to climate change and yield mitigation co-benefits

The adverse impacts of climate change on growth will be lower if macroeconomic stabilization and structural reforms are undertaken. If significant reforms are undertaken (as captured by the REF scenario in Figure ES-1), the average annual losses in GDP and household consumption relative to the baseline without climate change are closer to 1 percent annually in 2024-2030 even in the dry and hot climate scenario, versus close to 1.5 percent in the CG scenario. This gap in losses between the two scenarios widens considerably in the two decades that follow.

Structural reforms will enhance resilience and reduce the cost of adapting to climate change. Agriculture provides one example. Without reforms in agricultural policies, Ethiopia will continue to need significant imports of agricultural commodities to meet domestic demand. With reforms, however, agricultural output will likely increase significantly even with climate change so that production would outstrip demand by the end of the decade and yield a significant increase in marketable/exportable surplus from 2030 onwards. Climate change, moreover, due to improved growing conditions for some crops, helps to increase these surpluses (relative to demand), particularly after 2040, from 20 percent to 25 percent. Another example is provided by infrastructure, such as roads and bridges. In a scenario without structural reform measures, additional repair and maintenance costs of US\$755 million for roads and bridges would be incurred between 2041 and 2050 to offset the impacts of climate change. However, these costs would fall by over a sixth if structural reform measures are implemented. A final example is that of impact of climate change on diseases. Higher temperatures and greater precipitation would increase malaria and dengue transmissibility by 2050. Mortality and morbidity due to dengue, in particular, would rise by as much as 50 percent without any complementary reforms in health policies. However, if those health sector reforms are implemented these impacts are much less severe, with mortality and morbidity rising by only 14 percent by 2050.

Investments in sustainable land management and to improve the productivity of the livestock sector, as part of Ethiopia's development plans and reform agenda, also produce mitigation co-benefits. Investment in sustainable land management programs will build resilience to climate change while reducing carbon emissions. The highest carbon storage and sequestration rates are seen in the forested regions in the southwest and south-central area of the country covering parts of Gambella, Oromia and the Southern Nations, Nationalities, and Peoples' (SNNPR) regions. Since these areas are also those estimated to have among the highest land use change and forestry (LUCF) emissions rates, investing in land restoration and management in these locations will yield carbon credits. Similarly, productivity improvements in the livestock sector would decrease GHG emission intensity factors, so as to result in lower emissions than the 2030 NDC target of 180 MtCO₂e. Increased yields with reduced headcounts result in emissions under the REF scenario being 10 percent lower than those under the CG scenario without reform. Additional productivity measures, such

as oilseed feeding and manure management, could further reduce GHG emissions by up to 40 percent.

Structural reforms alone will not suffice; additional measures will be needed to adapt, including a greater shift away from center, state-driven development

Accelerating the implementation of structural reforms will help to strengthen resilience, but additional measures will be needed to adapt to climate change.

Such measures will consist of both additional policies as well as incremental investments aimed not at increasing productivity *per se* but rather at reducing the costs associated with climate change impacts. For instance, in managing water resources, adaptation to the adverse effects of climate change due to changes in precipitation and its variability could include actions aimed at increasing the efficiency and safety of existing water storage systems, using integrated watershed management, and increasing groundwater recharge. Similarly, setting priorities for agricultural research and development based on forecasts of how climate change will affect different crop varieties and livestock breeds in the future is an example of adaptation in the agriculture and livestock sectors. Investments that promote adaptation to climate change will be especially important for transport and energy infrastructure. Proactive adaptation measures, such as increased road base strength and paving of unpaved roads, could help avoid disruptions in service delivery. Given Ethiopia's dependence on hydropower, adaptation should focus on addressing the increased variability of generation that will result from changes in precipitation patterns. And the resilience to climate-induced damage to electricity infrastructure will need to be improved.

By complementing structural reforms, adaptation measures can further reduce the damages imposed by climate change.

Repair and maintenance costs associated with damage to roads and bridges can be reduced both by reforms and by additional measures to adapt to climate change. As noted, reforms alone would reduce these costs by about a sixth relative to their levels with no sectoral reforms. The combination of reforms with adaptation measures, such as paving and better road construction, would reduce these costs by another 20 percent. Similarly, adaptation measures, such as enforcing better design and engineering standards for new infrastructure, could reduce the capital losses from climate change induced flooding in Addis Ababa by 90 percent.

Design of Ethiopia's policies to address climate change impacts will also have to account for inherent uncertainties in climate impacts.

Although climate change projections point to a rise in mean annual temperature over time, the precise temperature increases differ by scenario. Moreover, although rainfall variability will be higher, there is no clear trend for mean annual precipitation levels along with high uncertainty across scenarios. Along with the spatial variation in these impacts, these projections imply that climate change impacts across Ethiopia are difficult to predict even into the rest of this decade, let alone over the next quarter century. The first implication of greater uncertainty is that private actors will need to play a more significant role in adapting to climate change. In a situation in which the precise effects of climate change will become known only over time, the role of public policy should be to provide the framework and incentives within which private enterprises, farmers and consumers can make decisions about adaptation. As circumstances change and uncertainties about climate change are resolved, the framework can be modified to reflect these changes and decentralized private actors can adjust their decisions accordingly. The second implication is that local governments need to be encouraged even more so that tailored responses can be undertaken across different parts of Ethiopia. Given the diversity of climate change impacts across the country, the response will need to reflect local conditions. This means that local governments, which currently have limited resources, capabilities and responsibilities, will need to play a much larger role both in designing responses and, even more importantly, in implementing them.



Setting Priorities

Given Ethiopia's resource and capacity constraints, it is critical that actions to strengthen climate resilience be prioritized. Ethiopia's climate-related challenges are only one of several the country faces in achieving its development goals. In addressing these challenges, whether macroeconomic, structural, social, or climate-related, it has limited resources and implementation capacity that it can marshal. It is critical, therefore, that actions aimed at climate resilience be chosen to target the most significant impacts of climate change while also addressing other challenges. Three broad priority areas emerge.

Priority 1: Accelerate implementation of structural reforms and promote social safety net programs

Macroeconomic stabilization and structural reforms will yield both development benefits and strengthen climate resilience. Ethiopia's current economic situation features serious macroeconomic imbalances, few jobs, and widespread poverty, insecurity and vulnerability. Without addressing the causes of these problems through a program of macroeconomic stabilization and structural reforms, it will be difficult to undertake actions to build climate resilience. By spurring the currently stalled structural transformation of the Ethiopian economy and transition to a market economy, these reforms will help make progress towards inclusive growth and poverty reduction.

Ethiopia's social safety set programs will need to be reformed to be responsive to climate shocks. Of particular importance, given the large adverse impacts of climate change on the poorest and the most vulnerable in society, are reforms to Ethiopia's social safety net system. Ethiopia's existing social safety net programs already support adaptive capacity at the household level. Nevertheless, the stresses from climate change imply that these programs will need to be strengthened. Key priorities are included in table ES-1 below:

Table ES-1: Priorities to accelerate macroeconomic stabilization and structural reforms		Sector
1.1	Addressing the overvaluation of the exchange rate and product and factor market distortions, removing regulatory, logistical and export barriers and accelerating accession to the WTO; Deepening financial intermediation in the economy; Reducing financial repression; Advance SOE reform to level the playing field for the private sector. Expand the fiscal envelope through tax policy and administration measures as well as continued fuel and utility tariff reforms.	Cross-cutting
1.2	Ensuring the adequacy and sustainability in the financing of these programs; Developing digital systems for social protection programs; Expanding coverage to include a larger portion of the rural and urban poor and vulnerable; Better targeting to ensure the protection of those most in need; Better coordination with humanitarian assistance programs to enhance responsiveness to shocks.	Cross-cutting

Priority 2: Invest in climate-resilient infrastructure

Ethiopia must address its considerable infrastructure needs in ways that recognize the likelihood and impacts of climate change. Among the most significant

impacts of climate change will be damage to existing infrastructure and disruptions to the provision of infrastructure services. Such disruptions and damage, whether to transport, power or telecommunication systems, will lead to large and sustained economic losses. In addition, Ethiopia has a large infrastructure deficit, which will need to be filled for development aspirations to be met.

Three sets of actions are needed with regard to infrastructure. First, existing infrastructure needs to be managed so that it is more resilient to climate-change related shocks. For instance, for power infrastructure, system preparedness and resiliency plans should be developed to respond to natural hazards, and load dispatch systems modernized to reduce the risk of blackouts. For roads, strategic maintenance plans should be developed and executed to address the backlog of maintenance. In addition, although the recently approved Public Investment Management Guidelines prepared by the Ministry of Planning and Development (MoPD) require the assessment of climate change risks, these considerations also need to be incorporated into the management of public assets and the asset registers maintained by public bodies need to record critical or at-risk infrastructure/assets. Second, new infrastructure needs to be designed in ways that are less vulnerable to climate change. For instance, integrated watershed management should be used to increase groundwater recharge and reduce siltation in reservoirs and dams. And for electricity generation, the mix should be diversified over time by adding solar, wind and geothermal sources. Finally, the GoE should consider policy reforms to promote climate action in public investment and procurement. For one, climate co-benefits of green public procurement have not yet been explored. Assigning weights to green bids and expenditures would build resilience in public procurement frameworks. Amendments to the Environmental Impact Assessment Proclamation, as well as sector-specific guideline revisions, to explicitly require public and private project proponents to consider the GHG impacts of these projects and their resilience to climate change, is another key reform.

Table ES-2: Measures to cope with climate vulnerability in key infrastructure sectors		Sector
2.1	Investments in a combination of grey (technical) and green (nature-based) solutions are essential to mitigate urban disaster risks such as flooding, landslides, and heat stress	<i>Urban</i>
2.2	Diversify electricity generation mix—through investments in solar, wind, and geothermal; Construct regional power interconnections to enable electricity trade to balance demand-supply variations	<i>Energy and Extractives</i>
2.3	The backlog of maintenance activities is exposing Ethiopia's transport infrastructure to climate risks, and strategic maintenance plans need to be sufficiently budgeted and executed; Invest in an integrated multimodal transport network to improve the redundancy of the network and ensure uninterrupted movement of people and goods	<i>Transport</i>
2.4	Increase the efficiency and safety of existing storage and increase the spectrum of multipurpose storage	<i>Water</i>
2.5	Health: Upgrade the country's health care infrastructure to support more systemic climate change resilience; Education: Build schools and other education facilities to higher design standards to cope with the impacts of climate change	<i>Social Services</i>
2.6	Ensure diversity in connectivity routes and co-building fiber optic cables alongside other infrastructure (e.g., power lines or roads)	<i>Digital/ Communication</i>

Priority 3: Support greater decentralization of climate response

Structural reforms will encourage adaptation to climate change by different private actors. Specifically, the shift to a private sector-led market economy and the removal of distortions mean that firms will reallocate resources and investments in response to price signals and towards activities and sectors that offer the highest returns. They will also be able to respond appropriately to risks, including those due to climate change. Ethiopia should continue reforms to liberalize the banking sector and deepen insurance and capital markets.

Policy interventions should also focus on expanding access to finance and insurance options for the agriculture sector, given its importance to the economy and vulnerability to climate change.

Additional measures will be needed to promote adaptation to climate change by the private sector. To further incentivize greater private sector participation in the climate agenda, it will be necessary to improve coordination, better align priorities, and enhance accountability across public agencies by strengthening the relevant regulatory frameworks and directives as stipulated in the Administrative Procedure Proclamation (1183/2020). Building on the recent update of the PPP framework, it will be important for the GoE to maintain transparency and ensure a level playing field in all transactions, and to monitor and incorporate related contingent liability risks into its fiscal risk statement. Developing a green finance taxonomy and strategy is needed to address key barriers to green finance in relation to high perceived risks, large financing needs, and long tenors. De-risking instruments such as guarantees and credit enhancements will increase access to finance for renewable energy infrastructure. Over the medium term, the central bank should also move to integrate climate-related financial risks into its supervision frameworks, while the Ethiopian Accounting Standard Board should implement the upcoming IFRS S2 on climate-related disclosure.

Subnational governments need to be supported to play a larger role in formulating and implementing policies to address climate change impacts. Because national and sectoral strategies on climate often do not assign roles explicitly to regions and woredas, strategic capacity for climate change at subnational levels is very low. Moreover, since regions have limited finances, subnational governments do not play a significant role in addressing climate change. And yet much of the implementation of climate interventions needs to be at the local level. To encourage climate action at the subnational level, ways of facilitating inclusive regional representation in federal-level governance and institutional coordination structures should be explored as part of the MoPD's ongoing review of the climate change governance and institutional coordination structure. The federal government should also consider how specific conditional grants could be used to support climate responses at lower levels of government. Subnational budgets and climate change project-specific transfers from the federal level are the main sources of climate finance at subnational levels. Climate change considerations are not used to determine the size of the block grants to regions, and nor are regions' differential climate change expenditure needs considered in determining regions' share in federal block grants. Finally, ongoing efforts to mainstream the climate agenda at the subnational level should be strengthened through capacity-building support and leveraging the woreda climate risk profiles and processes initiated by the Ethiopian Disaster Risk Management Commission (EDRMC).

In strengthening adaptive capacity to climate impacts, the priority should be on the lowlands. Incomes in the lowlands are particularly vulnerable to climate change impacts, while these areas are also home to some of the most vulnerable households in the country, including a substantial number that practice pastoralism. The impact of climate change on the livestock sector could be particularly severe for poor families who tend to use livestock as their primary saving mechanism, thereby increasing poverty. Actions to strengthen adaptive capacity should, therefore, center on the resources on which people in the lowlands depend the most as seen in Table ES-3 below. Investments in sustainable land management could reduce crop yield losses due to climate change related erosion by half. And targeting these investments in areas with the greatest potential to improve ecosystem services reduces these losses even further - by nearly 90 percent. These investments should be accompanied by expansion of rural land registration in the pastoral lowlands, to incorporate pastoralists' rights and strengthen their customary land administration institutions grounded in a localized understanding of political economy and fragility dynamics. Targeted adaptation measures should also aim at raising and sustaining the productivity of the livestock economy. Focus on reducing climate change impacts on the production of cattle milk, and goat and sheep meat.

Table ES-3: Measures to increase adaptive capacity to climate impacts in key sectors		Sector
3.1	Invest in sustainable land management; target investments in high-potential areas to improve ecosystem services; expand rural land registration in the pastoral lowlands	LUFC
3.2	Promote conservation agriculture; substitute pasture losses with imported feed; implement heat abatement measures (e.g., sprinklers and fans) in commercial cattle dairy farming	Agriculture

Financing Climate Action

Climate investment needs are significant and occur in the context of significant resource shortages. Bottom-up sectoral climate investment needs estimated in the CCDR to support adaptation and mitigation over and above baseline investments, cost about US\$27.6 billion until 2050 (NPV, cumulative terms) in agriculture, livestock, sustainable land management, urban infrastructure, roads and bridges and water storage (Table ES-3). This is equivalent to 3.6 percent of cumulative GDP until 2050, but investments will have to be frontloaded if the worst impacts of climate change are to be protected against. Meanwhile, as the CCDR documents, while it is difficult to fully ascertain the volumes of climate finance being mobilized by Ethiopia, these are estimated to be in the range of about \$0.6 to 3.2 billion per year with indications that these are declining. Domestic mobilization of resources is also limited in general; at 7 percent, Ethiopia's tax-to-GDP ratio is insufficient to fund essential spending, let alone drive an acceleration in growth through productive investments or finance climate investments. Meanwhile concessional ODA flows have fallen in recent years and access to global capital markets is limited by debt vulnerabilities.

Table ES-3. Additional investment needs to support adaptation and mitigation (CRG) relative to REF (US\$, NPV with 3% discount rate)			
	2024-30	2031-40	2041-50
Agriculture crops*	2,048	7,191	13,560
Livestock	237	1,035	1,135
Water storage	158	706	664
Sustainable land manager	1,547	589	288
Hydropower*	5,906	12,139	15,820
Urban flooding	19	348	1,058
Roads and bridges	1,846	2,579	3,136
Total	4,912	9,142	13,603
Memo: Clean cooking	1,060	1,890	1,585

Source: World Bank, Industrial Economics. Notes: REF projects a dismantling of major macroeconomic, exchange rate and structural distortions in the economy. *Half of agriculture investments and all hydro investments are included in REF as part of planned sector reforms. Every other category shows the additional CRG investments on top of planned REF investments. Clean cooking costs are difficult to ascertain and given their magnitude represent major fiscal trade-offs and not included in overall investment costs or macro-simulations. For some investments, it is hard to distinguish the extra adaptation cost from the baseline investment cost (e.g., for a new bridge, that is also a stronger bridge able to withstand climate impacts).

In the near term, the priority is to mobilize more domestic resources domestically and unlock access to grant/concessional resources through structural reforms. By expanding the role of the private sector in the economy, and complemented by tax reforms, structural policy reforms will help to grow the tax base and thus expand fiscal resources. Grant/concessional finance will, for the foreseeable future, remain the most important (and the cheapest) source of external finance for climate purposes. With multilateral resource envelopes hinging on performance-based allocation (PBA) formulas, Ethiopia must

implement stronger policies that underpin these. Given constrained public finances, it is important that public resources are used well to support climate action by building on existing initiatives of phasing out fossil fuel subsidies and rationalizing electricity tariffs, and targeted resource spending where vulnerabilities to climate impacts (e.g. among lowlands) is greatest or where climate co-benefits can be realized (e.g. green procurement and investment).

It is imperative to get financial resources flowing to the private sector. This will require reforms to improve financial sector stability and depth and strengthen the regulatory and supervisory framework and include addressing the nexus between SOEs and state-owned banks, the opening of the banking sector to foreign investment, establishment of deposit insurance; and increasing insurance market penetration. Ongoing reforms to develop capital markets will also provide an avenue for the issuance and exchange of climate finance instruments such as green bonds and support private capital mobilization over the medium term.

The National Bank of Ethiopia (NBE) should move to integrate climate-related financial risks in its prudential supervision. Like many other central banks globally, the NBE should begin to strengthen financial sector regulation to better manage climate-related and environmental physical and transition risks. It will help Ethiopia to develop a green finance taxonomy and strategy to address some of the key barriers to green finance in relation to high perceived risks, large financing needs, and long tenors and to develop de-risking instruments such as guarantees and credit enhancements. Given the agricultural sector's importance to growth, jobs and livelihoods, expanding access to finance through instruments such as factoring, warehouse receipts, and leasing; and access to insurance will help.

Innovative/blended financing flows need to be leveraged effectively over the medium term. Financing innovations such as structured-impact bonds, green/blue bonds, emission-reduction linked bonds, sustainability-linked bonds, and debt-for-nature swaps hold significant promise to attract investors with different risk profiles and investment horizons, potentially free up fiscal space, and reduce hurdle rates for privately funded climate investments. Ethiopia must strengthen capacities, including at the CRGE facility, to: i) mobilize, track, monitor and report domestic and external climate flows and their use; ii) publish climate expenditure information on budget, including as part of the Citizens' Budget, on outturn information, and on all appraisals of public investment projects; and iii) enforce transparency provisions in public procurement laws and regulations. Building public sector capacity to develop bankable projects, especially for adaptation, is also critical. Together with mechanisms to monitor investment projects, such capacity will help ensure that de-risking by the GoE will not lead to fiscal liabilities.

Finally, it will be necessary to address residual risks from climate change. To insure against climate risks, and better manage residual risks, Ethiopia must strengthen identification, risk reduction, preparedness, and climate disaster expenditure tracking and resilience measures, and develop a well-diversified disaster risk layering strategy. Droughts, floods, and related food insecurity are the primary drivers of disaster response costs in Ethiopia and carry significant fiscal costs. The dependency on external funding, especially humanitarian appeals, provides uncertain, insufficient, or delayed resources. Budget reallocations should be well-planned to minimize opportunity cost, and be ring-fenced and tightly regulated. Ethiopia should continue investments in Early Warning Systems and delivery mechanisms. The GoE needs to build financial protection at local levels and enable the private sector to take on more risk through contingency credit and insurance (for both public and private sectors). When broader market access is restored, Ethiopia should consider the incorporation of debt "pause clauses" in its debt instruments and participate in sovereign disaster risk insurance and risk pooling services.



1

**CLIMATE-RELATED
RISKS AND
OPPORTUNITIES FOR
DEVELOPMENT**



Climate-Related Risks and Opportunities for Development

1.1 Development context

1.1.1 Weakening economic performance

Against a backdrop of conflict and heightened vulnerability to multiple shocks, Ethiopia's economic growth has slowed. Between 2004–2019, state-led economic development resulted in exceptionally high growth rates of over 10 percent, placing Ethiopia among the fastest-growing economies in the world. But policy distortions, compounded by internal and external shocks, including the COVID-19 pandemic, Russia's invasion of Ukraine, soaring global food and energy prices, and conflict in the Tigray region and other parts of the country, have since reduced GDP growth to about 6 percent. While strong economic performance in the agriculture and services sectors resulted in higher-than-expected GDP growth of about 6.4 percent in FY22, growth in the industrial sector has further weakened.¹ And though the current growth rate is not low when compared to other low-income countries, it will not be sufficient to achieve development goals as detailed below.

Ethiopia's economic performance is further handicapped by macroeconomic fragility that has its roots in long-running policy distortions. Ethiopia's state-led, import- and public investment-intensive growth model, at the heart of which was an overvalued exchange rate and pervasive price distortions, slowed the country's transition to a market economy and undermined external competitiveness. Consequently, in recent years, the country has experienced significant macro-imbalances and financing challenges, a sharp decline in external reserve buffers, foreign exchange shortages and a growing parallel market premium, and high inflation. Classified as being at "high risk" for debt distress since 2017, it has already undergone a successful (voluntary) debt restructuring in 2020 and in 2021 applied for debt relief through the G-20 Common Framework. Overall, the country faces an acute shortage of resources needed to finance development and reconstruction expenditures, to service debt, and to finance imports.

Poverty reduction has also slowed amid multiple, compound shocks of conflict, droughts and food price inflation. Despite significant reductions in poverty over the past few decades, the share of people living below the international poverty line (measured at \$2.15 a day in 2017 PPP) was projected to stand at 24 percent in 2022, lower than the 27 percent recorded in 2015 (the most recent official poverty survey period), but declining at a much slower pace than in previous years.² The pastoral and drought-prone lowland areas of the country have higher poverty rates. Evidence also suggests that the benefits from growth have been unevenly distributed in recent years. For instance, between 2011 and 2016 urban areas in the country grew at a higher rate than rural areas, with consumption levels declining for already poorer rural households. Therefore, inequality as measured by the Gini coefficient increased in the period.³ Preliminary evidence for more recent years suggests that household consumption growth slowed after 2019 due to the overlapping crisis (conflict, droughts, and food price inflation). Urban

- 1 World Bank Group. 2023. Macro Poverty Outlook for Ethiopia: April 2023. ([HERE](#))
- 2 World Bank. 2022. Macro Poverty Outlook. ([HERE](#))
- 3 World Bank. 2020. Ethiopia Poverty Assessment 2020. ([HERE](#))

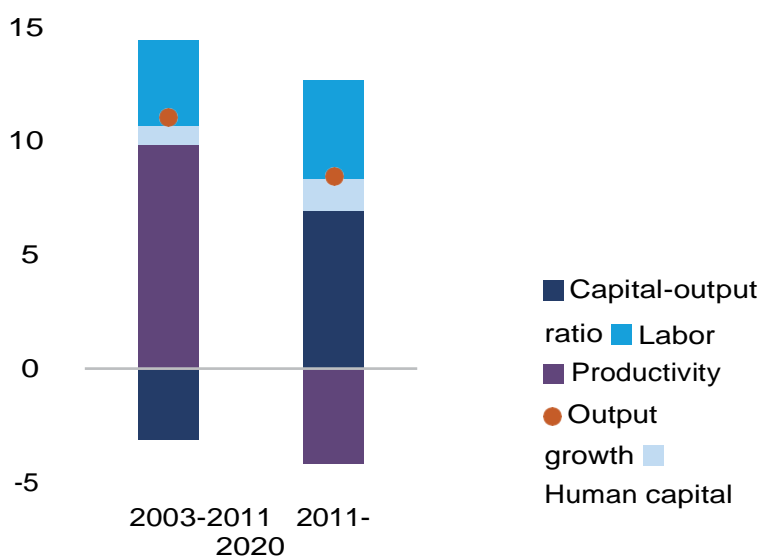
households are projected to have been impacted more heavily, pointing to a potential reversal of earlier progress in urban areas.⁴

1.1.2 A stalled structural transformation

With large state-led capital investments driving growth over the past two decades, the country’s structural transformation stalled. Economic growth over the past decade was fundamentally driven by capital accumulation that failed to generate productivity growth in the broader economy (see Figure 1.1A); indeed all productivity gains have been within-sector and there has been limited across-sector productivity growth, pointing to stalled structural transformation (Figure 1.1B and Table 1.1). In recent years, amid a large state and regulatory footprint, growing foreign exchange shortages and tightening import restrictions, growth in manufacturing (and the private sector, more broadly) has weakened and growth has also become more tepid in services and construction (Figure 1.1C). The share in GDP of manufacturing currently stands at 5 percent, with almost no change in the last 20 years despite large- scale investments in industrial parks.⁵

The agriculture sector has seen some productivity growth, but much remains to be done. The reinforced Agriculture Development Led Industrialization (ADLI) strategy, which emphasized supply- side agriculture interventions (including extension services),⁶ and supported an increase in agricultural growth driven by productivity improvements. However, agriculture remains predominantly rainfed with less than 5 percent of the potentially irrigable land.⁷ Moreover, labor productivity has stagnated in agriculture,⁸ and the share of the sector in GDP is unchanged from two decades ago (Table 1.1).

Figure 1.1A. Contributions to growth 2003–2020 (% points)

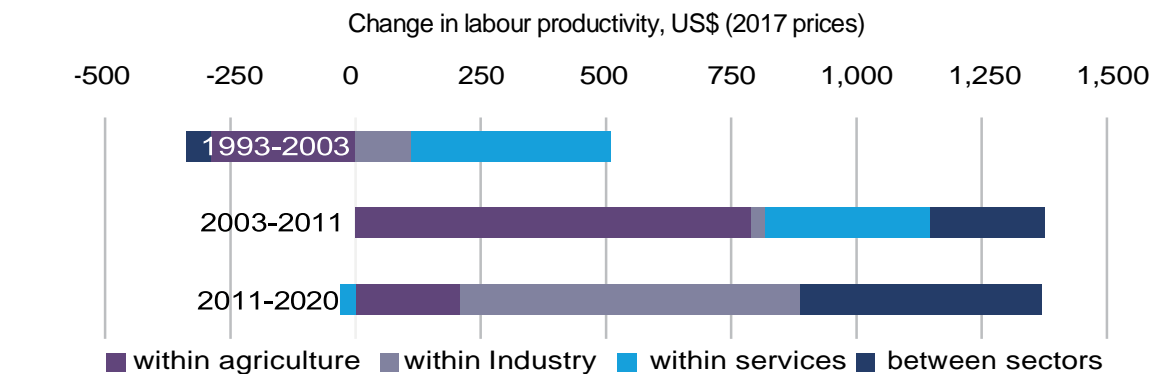


Source: World Bank 2022, Ethiopia Country Economic Memorandum

4 World Bank. 2023. Ethiopia Poverty Assessment 2024 (Project Concept Note P179484).
5 World Bank. 2023. On the Path to Industrialization: A Review of Industrial Parks in Ethiopia.

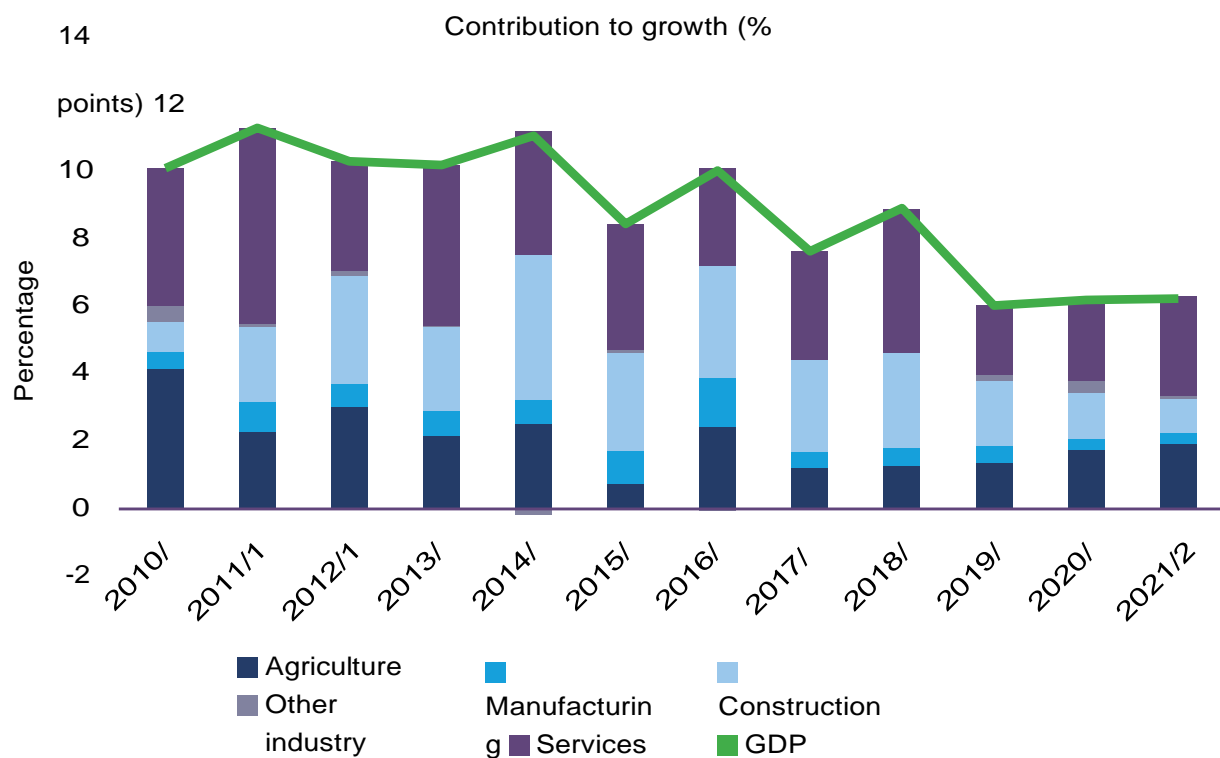
- 6 Ethiopia Country Economic Memorandum. 2022.
- 7 Mekonnen, D.K., G.T. Abate and Seid Yimam. 2022. Irrigation and agricultural transformation in Ethiopia. IFPRI Project Note October 2022. Washington, DC: International Food Policy Research Institute (IFPRI). <https://doi.org/10.2499/p15738coll2.136461>.
- 8 Ethiopia CEM. 2022.

Fig 1.1B. Almost all productivity growth in recent years has been within sectors vs between sectors



Source: World Bank staff estimate

Figure 1.1C. Growth in Ethiopia has slowed in recent years



Source: Ethiopia CEM 2022 from the MoPD

Table 1.1. Structural transformation has stalled

Distinguish	1992-2002	2003-2019
GDP Growth (% , average)	4.2	8.8
Public Investment (% of GDP, average)	7.8	15.8
Change in GDP Shares (% points)		
Agriculture	-25.1	0.3
Industry	6.6	9
Services	14.6	-6.5

Source: Ethiopia CEM 2022 from the MoPD

Foreign exchange distortions and limited integration into global trade have also further limited Ethiopia's narrow export base, and export growth has not kept pace with GDP growth. The share of exports in GDP has fallen from its peak of 8.4 percent in 2011 to just 3.2 percent in 2022. Exports diversification is limited, with 70 percent of exports coming from agriculture, mainly coffee, and declining numbers of new products being exported every year. Ethiopia has significant scope for reducing tariffs to boost trade, which could be facilitated through an accession to the WTO, and the country leveraging its membership to the African Continental Free Trade Area (AfCFTA).

Recent economic growth has not been accompanied by expanding job opportunities.⁹ Job creation in the last two decades has been driven by the service sector mainly through self-employment in micro, small and medium enterprises in urban areas.¹⁰ Industry remains an urban phenomenon too and suffered from job losses between 2013 and 2021 due to structural weaknesses which were worsened by the social and economic consequences of COVID-19.¹¹ The agricultural sector employs two-thirds of the labor force, though number of jobs in the sector declined between 2013 and 2021 by 1.7 million, due to a combination of declining employment opportunities in the rural economy and rural workers becoming more engaged in off-farm segments of the food system.

Though the nature of migration has changed in Ethiopia with an increasing trend to urban areas, overall levels of internal migration remain relatively low, adding a further drag on economic growth. Conflict, famine, and resettlement schemes have and continue to drive internal displacement of people in Ethiopia. However, internal migration in Ethiopia is also increasingly characterized by urbanization. The urban population has increased significantly (from 9.9 million in 2000 to 25.4 million in 2020), driven in large part by rural-urban migration.¹² Overall, however, internal mobility remains limited: only about 5 percent of Ethiopians have migrated to their current place in the last 5 years—much lower than in the neighboring countries of Uganda (25 percent) or Kenya (20 percent).¹³ Labor market restrictions and slow overhaul of land registration system underlie the low levels of internal migration and compound the challenges of a stalled structural transformation. As an example of labor market restrictions, it is difficult to transfer Kebele IDs (the “kebele” or community-based identity cards most prevalent in the country) to urban IDs as the latter require a minimum length of stay and release letter from the home areas, which, in turn, limits access of recent migrants to public services and support schemes and discourages migration.

Deficits in natural, physical, and human capital are further challenging the country's structural transformation. Natural resources, in the form of land and water, are affected by unsustainable management. Land degradation costs the economy about US\$305 million per year due to its impacts on agriculture alone.¹⁴ Gaps in access to basic services and infrastructure are considerable. Nearly half the population lacks access to electricity, and households remain dependent on biomass for cooking and heating.¹⁵ Only 22 percent of people live within 2km of all-season roads.¹⁶ Digital connectivity too is lagging behind other countries in the region.¹⁷ While gaps are most pronounced in rural areas, fast-growing urban populations also struggle to access basic services and infrastructure. Human capital also remains low. Education remains out of reach for the poorest households, and one-fifth of school-aged children and youth have never been to school.¹⁸

9 World Bank. 2023. From Productive Safety Nets to Productive Jobs (forthcoming).

10 World Bank. 2023. From Productive Safety Nets to Productive Jobs (forthcoming).

11 World Bank. 2023. From Productive Safety Nets to Productive Jobs (forthcoming).

12 Schewel, K., and L.B. Asmamaw. 2021. “Migration and development in Ethiopia: Exploring the mechanisms behind an emerging mobility transition.” *Migration Studies*, Vol 9(4).

13 World Bank. 2022. Voluntary Migration in Ethiopia. ([HERE](#))

- 14 Gebreselassie S. et al. (2016). "Economics of Land Degradation and Improvement in Ethiopia." In: Nkonya, E., Mirzabaev, A., von Braun, J. (eds) Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development. Springer, Cham. ([HERE](#))
- 15 World Bank. World Development Indicators – Access to electricity ([HERE](#)), Access to clean fuels and technologies for cooking ([HERE](#)).
- 16 World Bank. 2019. World: Measuring Rural Access Update 2017/18. ([HERE](#))
- 17 Tesfachew, T. 2022. "Ethiopia's drive to advance digital transformation. South-South Integration and the SDGs: Enhancing Structural Transformation in Key Partner Countries of the Belt and Road Initiative." United Nations Conference on Trade and Development, ECIDC Project Paper PB 2. [HERE](#); Adame, B.O. 2021. "The Ethiopian telecom industry: gaps and recommendations towards meaningful connectivity and a thriving digital ecosystem." *Heliyon*, 7(10), p.e08146. [HERE](#)
- 18 Federal Democratic Republic of Ethiopia. 2020. Ten Years Development Plan, 2021–2030. ([HERE](#))

1.1.3 An ambitious reform agenda

The Government of Ethiopia (GoE) has laid out an ambitious policy agenda to transform the country into a diversified and resilient middle-income economy by 2030. The 10 Years National Development Plan (10YNDP) for 2030 defines ambitious development targets to achieve annual GDP growth rate of 10 percent, which, in turn, is considered sufficient to reduce poverty to 7 percent in 2029/30.¹⁹

To correct the macroeconomic imbalances and address the current vulnerabilities, the Home Grown Economic Reform Agenda (HGERA) aims for a wide range of reforms: macro-financial measures to stabilize the macroeconomy and reduce macro-vulnerabilities; structural reforms to alleviate business constraints to create an enabling environment for private sector investment; and sectoral policies to address sector-specific institutional and market failures and enhance productivity in key economic sectors, which include agriculture, manufacturing, minerals, tourism, and ICT.²⁰

1.1.4 Addressing development needs amidst conflict and inflation

Ethiopia faces the challenge of addressing its development needs in the face of persistent and widespread political conflict. Between 2020 and 2022, fighting between state and rebel forces in the northern region of Tigray resulted in large-scale displacement and created large humanitarian needs. Around 2.2 million people remain displaced and over 20 million people, or close to a sixth of the country's population, remain reliant on humanitarian assistance because of the conflict.²¹ The peace agreement signed between the Government and the Tigrayan forces in November 2022 paves the way to deliver the much-needed humanitarian assistance and start the recovery and reconstruction of the affected areas in northern Ethiopia, though not without its challenges. It is estimated that damages from the recent conflict amount to 20.4 percent of GDP and total reconstruction and recovery needs to about US\$20 billion.²² Elsewhere, the fighting in the Amhara (which has intensified recently), and Afar regions and the reemergence of old conflicts in Benishangul-Gumuz and Oromia, and in Konso in the former Southern Nations, Nationalities, and Peoples' (SNNP) region have also resulted in significant physical damage to buildings and other infrastructure. Post-conflict reconstruction needs will place additional demands on the already stretched public finances. An environment of political instability and conflict also makes it challenging to create a consensus around the design and implementation of a long-term economic agenda by increasing tension between ethnic groups and exacerbating competition between groups and regions for political power and scarce resources.

High inflation in the backdrop of conflict is likely to exacerbate the food security situation. Inflation remains very high at around 30 percent and is increasingly driven by policy factors, notably fiscal dominance and monetary financing of deficits amid revenue pressures.²³ Food inflation has slowed but its impact on household budgets, which partially depends on whether the household is a net seller of food, has been found to be largely negative²⁴ and households have limited opportunities for substitution of staples. Data from a recent World Bank survey in pastoral and agro-pastoral areas shows that each day of a violent conflict event registered within any community increases food poverty by more than 12 percent, likely compounding the effect of inflation.²⁵

19 Federal Democratic Republic of Ethiopia. 2020. Ten Years Development Plan, 2021–2030. ([HERE](#))

20 Federal Democratic Republic of Ethiopia. 2020. A Homegrown Economic Reform Agenda ([HERE](#)).

21 Federal Democratic Republic of Ethiopia. 2022. Ethiopia Damage and Needs Assessment, based on IOM Displacement Tracking Matrix ([HERE](#)).

22 Federal Democratic Republic of Ethiopia. 2022. Ethiopia Damage and Needs Assessment.

- 23 World Bank Group. 2023. Ethiopia Monthly Economic Update – March 2023.
- 24 World Bank Group. 2022. Ethiopia Rural Income Diagnostics Study – Leveraging the Transformation in the Agri-Food System and Global Trade to Expand Rural Incomes.
- 25 World Bank. 2023. Ethiopia Poverty Assessment 2024 (Project Concept Note P179484).

1.2 Increasing risks from climate change

1.2.1 High impacts of natural hazards

Natural hazards are further increasing vulnerability and adding to development challenges. Ethiopia includes several different climatic zones with high spatial and temporal variability in precipitation patterns.²⁶ These climate conditions lead to considerable risks from natural hazards, such as droughts and floods. A total of 16 drought events and 32 riverine floods have been reported in the country since 1900.²⁷ It is estimated that 5 million people are exposed to an average drought and 0.25 million people to an average flood event every year.²⁸ In addition to the widespread human suffering, such events also impact the economy by increasing the need for humanitarian assistance, damaging infrastructure, and causing disruptions in economic activity. A drought event with a 1-in-5 year return period is estimated to cause economic losses of over US\$1 billion, rising to over \$3 billion for a 1-in-100 year drought event.²⁹

The cumulative effects of the ongoing drought, the most severe in the last 40 years, have been devastating for people in the already arid pastoral areas of Ethiopia, which cover two-thirds of the land mass of the country. After a sixth consecutive poor or failed rainy season, more than 22 million people are estimated to be food insecure, while 11.8 million are said to have experienced significant livelihood losses in the drought-affected areas of Afar, Somali, Oromia and former SNNP regions and Dire Dawa City Administration.^{30,31} Estimates from a recent survey of pastoral communities suggests that a contemporaneous drought shock reduces consumption by 15 percent,³² in line with previous estimates of the impact of drought in Ethiopia.³³ As a result of the prolonged drought, 13 million people are estimated to be living with insecure access to water, 1.4 million children are at risk of dropping out of school, and 4 million livestock have died.³⁴

At the same time, flooding has tested the resilience of people and infrastructure in other parts of the country. Heavy rains between August and October of 2022 in the moisture-reliant lowlands in the west of the country caused flooding in Gambella, displacing 185,200 people and affecting an additional 79,631 people through loss of crop land; death of livestock; destruction of property, schools, and health facilities; and contamination of water supply.³⁵

Impacts of climate shocks are unevenly distributed among and within households. Poorer households often tend to be more exposed to climate shocks or have fewer resources to cope with these and hence take risk-mitigating strategies that keep them from engaging in higher-productivity activities. Gender-based differences in labor, as well as access to resources and credit, can lead to higher vulnerabilities of women. During periods of drought, girls tend to be disproportionately affected by school dropouts to help collect water.³⁶ There is also empirical evidence that girls are more affected by malnutrition than boys after having been exposed to drought.³⁷

26 World Bank Group. 2021. Climate Risk Profile: Ethiopia. ([HERE](#))

27 EM-DAT Database. ([HERE](#))

28 World Bank Group. 2019. Disaster Risk Profile: Ethiopia. ([HERE](#))

29 World Bank. 2022. Climate & Disaster Risk Finance (CDRF) Diagnostic Report. ([HERE](#))

30 WFP. 2023. "More than a Decade of Drought: Impacts and lessons learned across the Eastern Horn of Africa 2011–2022." ([HERE](#))

31 OCHA. 2023. Ethiopia Situation Report. ([HERE](#))

32 World Bank. 2023. The State of Welfare of Pastoral Communities in Ethiopia – Forthcoming.

33 Hill, R.V. and C. Porter, 2017. "Vulnerability to drought and food price shocks: evidence from Ethiopia." *World Development*, 96, pp.65–77; Porter, C., 2012. "Shocks, consumption and income diversification in rural Ethiopia." *Journal of Development Studies*, 48(9), pp.1209–1222; Dercon, S, 2004. "Growth and shocks: evidence from rural Ethiopia." *Journal of Development Economics*, 74(2), pp.309–329.

- 34 OCHA. 2022. Horn of Africa Drought Regional Humanitarian Overview and Call to Action. ([HERE](#))
- 35 OCHA. 2022. Ethiopia Gambela Region Flood Update. ([HERE](#))
- 36 Stevenson, E.G.J., et al. 2012. "Water insecurity in 3 dimensions: An anthropological perspective on water and women's psychosocial distress in Ethiopia." *Social Science & Medicine*, vol. 75, no. 2, July 2012, pp. 392–400. [HERE](#)
- 37 Bahru, B. A., et al. 2019. "Drought and child undernutrition in Ethiopia: A longitudinal path analysis." *PLOS ONE*, vol. 14, no. 7, July 2019, p. e0220075. [HERE](#)

Climate shocks can act as a threat multiplier for conflict. There is a now substantial literature that demonstrates that climate change contributes to increased conflict, but often along indirect pathways. Ethiopia already has a high level of fragility as a result of internal conflict, increasingly severe occurrences of drought, and other political, ethnographic, and social factors. In the future, climate shocks could increase the incidence and complexity of such conflict. For example, an assessment of the relationship between food insecurity and conflict shows some hotspots in Afar, Somali, and Tigray regions. Of the nine woredas, or districts, with high levels of conflict, six also had severe levels of food insecurity. By exacerbating food security, climate change can act as a driver of conflict. Evidence shows that an increase of 10 days in the year with high temperature (>37 degree Celsius) increases the number of food-insecure households, on average, by 3 percent, and an increase of food-insecurity is correlated with an increase of the likelihood of future conflicts at woreda level.³⁸

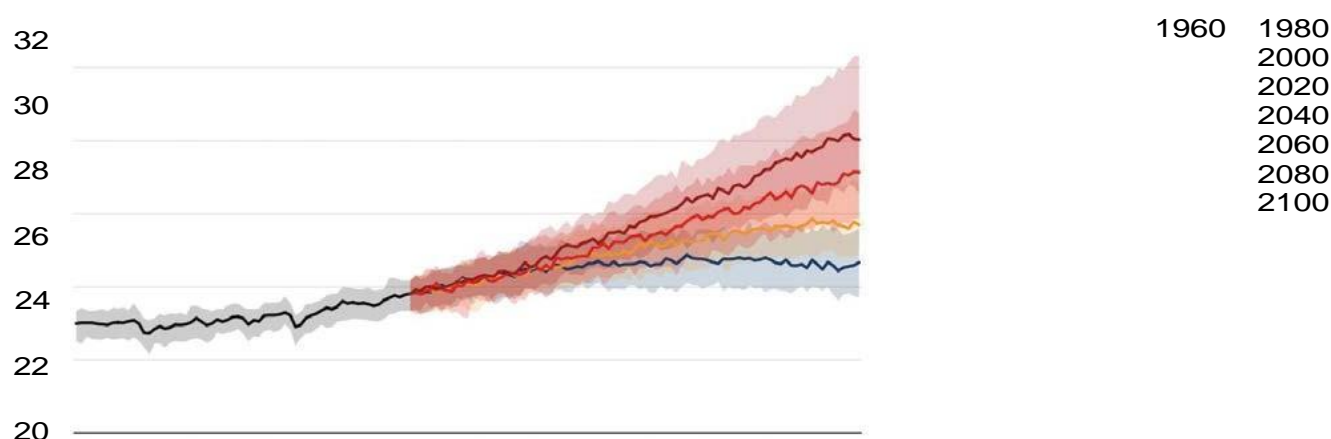
1.2.2 Increasing climate variability and uncertainty under climate change

Climate change projections suggest rising temperatures, but a high level of uncertainty about the direction of change of mean precipitation levels. Recent climate change projections³⁹ indicate a rise in mean annual temperature over time across the range of future climate scenarios, though the extent of temperature increase varies by scenario, and variability increases towards the end of the century (see Figure 1.2A). Projections for mean annual precipitation levels show no clear trend and very high levels of uncertainty across the climate change futures (see Figure 1.2B). Though the precipitation projections suggest *on average* a slightly wetter future, which could benefit some of the drier zones of the country, the uncertainty associated with these models implies that rainfall levels may very well decrease.

Temperature increases are likely to exacerbate extreme heat events in the hotter climatic zones of the country. In the SSPS3–7.0 future climate scenario, for example, which represents a high warming future, mean monthly temperatures could increase by 2–3°C by 2050, pushing mean temperatures to over 26°C in warmer months. Maximum temperatures are also projected to rise, as are the number of days with extreme heat. These extremes will mostly affect the hotter northern and eastern parts of the country, with around 40 additional days of extreme heat expected in the Afar region.

Increase in rainfall variability would similarly lead to an increase in hydrometeorological hazard events. Rainfall intensity, as measured by the maximum precipitation levels within five days, is projected to sharply increase over time and throughout the country, increasing, in turn, the risk of floods. The number of consecutive dry days, on the other hand, could increase slightly in the drier zones of the country, but not throughout the country. Furthermore, in extreme years, drought conditions could worsen

Figure 1.2A. Projected mean temperature in different climate futures (C) from 1995 to 2100

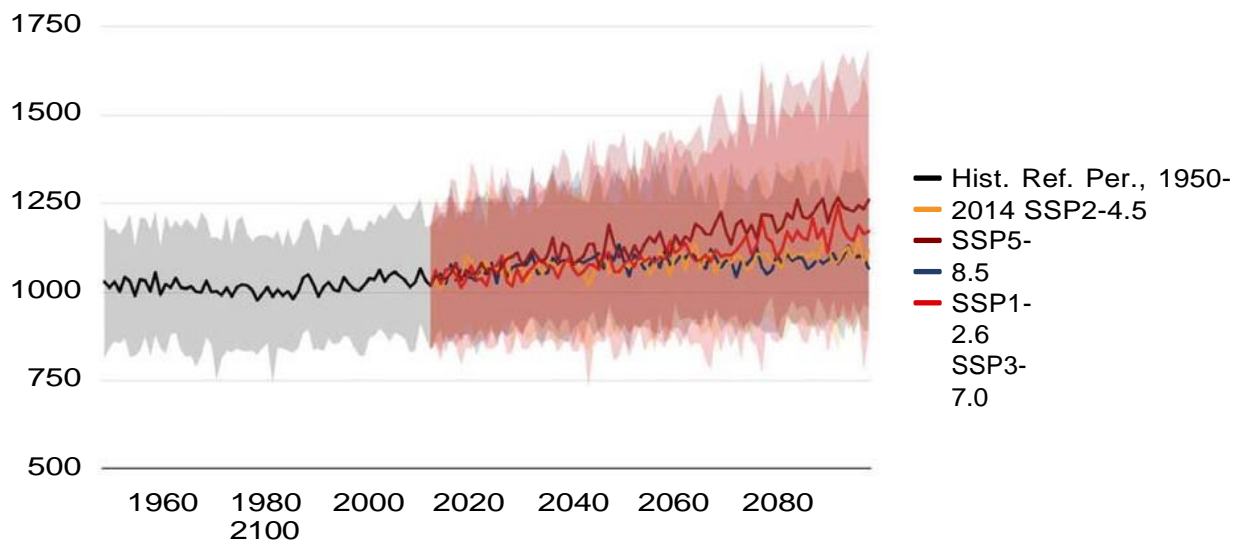


Hist. Ref. Per., 1950-2014 SSP2-4.5
SSP5-8.5 SSP1-2.6 SSP3-7.0



-
- 38 Pacillo et al. 2021. "Is climate a 'risk multiplier' in Ethiopia?" CGIAR/World Food Programme study. ([HERE](#))
- 39 Based on the CMIP6 (Coupled Model Intercomparison Project Phase 6) data ensemble of Global Circulation Models (GCMs) accessible through the World Bank Group, Climate Change Knowledge Portal. ([HERE](#))

Figure 1.2B. Projected mean precipitation in different climate futures (mm) from 1995 to 2100



Source: Climate Change Knowledge Portal

Notes: Values based on multi-model ensemble from CMIP6

1.2.3 Climate change could threaten development goals

As with natural hazards, climate change could affect the economy, and in particular its much-needed structural transformation. For one, structural transformation of the economy requires a significant increase in agricultural productivity, both to release labor from the sector and to diversify Ethiopia's export and production structures. Climate change could affect the economic performance of the agriculture sector, which tends to be the most vulnerable economic sector to climate impacts, by increasing the risk of droughts, increased soil erosion, shortened growing seasons, and shifting growing areas. Increased risk of droughts can also lead farmers to move away from high-value, market-oriented crops and high-risk-high-return agricultural technologies, and to instead focus on production oriented to attain self-sufficiency.⁴⁰ Similarly, as noted in the country's development strategies, growth of the mining and tourism sectors is planned to support the economic transition away from agriculture, through a focus on infrastructure development. The shift to industry and manufacturing will similarly require investments in energy, transport, and digital infrastructure. Climate change can threaten these development outcomes by affecting the quality and reliability of infrastructure services. The hydropower sector, which currently contributes to about 90 percent of Ethiopia's power supply, is highly sensitive to changing rainfall patterns, hydrological cycles, and increased risks of flooding or extreme winds. Extreme events can disrupt road and rail transport networks, and damage building assets. Flash floods can lead to fiber optic cuts, while extreme weather events can damage cell towers, which has a negative impact on connectivity for digital communications. In urban centers, where the population is concentrated in small areas, and which are often tourist destinations, such impacts can be severe. Climate change can additionally have large negative social and economic repercussions through impacts on water availability, which is needed for agricultural intensification, hydropower generation, industrial development, and rapid urbanization. Further, lack of basic infrastructure services such as electricity outage, damaged or blocked road access, and the cutting-off of internet, telecommunication and ATM services can be hindrances to the disaster response. Human capital, needed for growth in all sectors, could additionally be affected through the spread of vector-, water- or foodborne diseases, as well as the negative impacts of heat on labor productivity.

40 World Bank Group. 2022. Ethiopia Rural Income Diagnostics Study.

Climate change could be macro-critical in Ethiopia. In addition to dampening long-term potential growth, climate shocks could add to macro stability risks (e.g., due to output, export, revenue, and income shocks in different sectors of the economy) and add to fiscal and balance of payments pressures and undermine already low macroeconomic resilience. Ethiopia also faces significant policy trade-offs, given limited resources for meeting long-term development aspirations, let alone additional demands to invest in reconstruction following the end of two years of conflict in the Tigray region, as well as investments to strengthen resilience to climate change. Ethiopia's financial sector is likely to be vulnerable to many of the effects of climate change because of exposure to agriculture, real estate, energy and tourism sectors.

Climate change could increase inequality (between households, between regions) and threaten progress on poverty reduction goals. As noted, the poor tend to be disproportionately impacted by climate impacts, and have fewer resources, as also lower human and social capital, to cope with them. More severe impacts of climate change will only heighten these effects on poor households, exacerbating inequality. In Ethiopia's context of fragility, rising inequality due to climate impacts—across households and regions—could become a potent driver of conflict. As described earlier, the combined effects of political conflict and multi-year drought have resulted in Ethiopia having one of the largest populations of internally displaced persons (IDPs) in the world. Climate change could lead to increased migration, potentially leading to social friction and increased inter-group competition for resources like water and pastureland, especially in the lowland areas.

Addressing these macroeconomic, social, and climate-related challenges requires building resilience at all levels, and utilizing the potential for synergies. Building resilience to these multiple challenges requires restoring macro- and debt-sustainability and addressing policy distortions that have held back structural transformation, productivity, and private sector growth; restoring landscapes and improving access to water resources; closing the deficits with regards to infrastructure and basic services; investing in human capital through the expansion of education and health services; and rebuilding social capital and cohesion at the household and community-level. Such transitions will require huge investments, in addition to the vast funding needs for recovery and reconstruction and climate-proofing development. While hard choices will need to be made to prioritize what investments are supported with the limited resources, there are synergies too. Investing in physical, human, and natural capital and improving development outcomes will also increase resilience to different types of shocks, and thereby reduce the adverse impacts of climate change on the economy and people. Moreover, creating a more enabling business environment for the private sector to mobilize resources will support the already constrained public finance.

1.3 Challenges and opportunities of a green transition

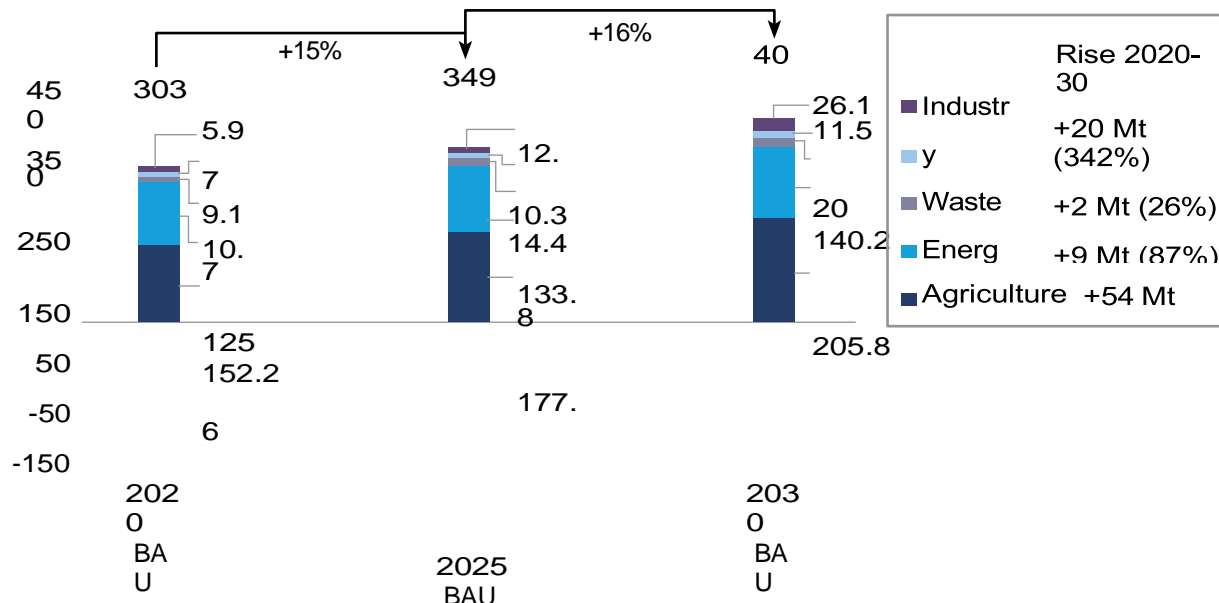
Currently Ethiopia has a small greenhouse gas (GHG) footprint, but emissions are projected to grow. In per-capita terms, GHG emissions have remained relatively constant over time at 1.64 tonnes (metric tons) of carbon dioxide equivalent (tCO₂e) per person, much lower than the world average of 6.48 tCO₂e per person, even though absolute emissions have grown by 2.3 percent per year since 1990.⁴¹ Today, more than 90 percent of these emissions are related to agriculture and land use change and forestry (see Figure 1.3), with 147 million tonnes of carbon dioxide equivalent (MtCO₂e) of agriculture-related emissions, the bulk, coming from the livestock sector. Contribution of the energy sector is minimal as, impressively, Ethiopia has one of the greenest electricity mixes globally, with approximately 90 percent of the installed generation capacity from hydropower, while the remaining 8 percent and 2 percent are from wind and thermal sources, respectively.⁴² Without any

policy interventions, emissions are projected to grow up to 2030, with the greatest rise in absolute emissions from agriculture (by over 50 MtCO₂e) and in relative emissions from industry (by over 340 percent).

41 Climate Watch (CAIT). 2023. Ethiopia Country Profile. [HERE](#).

42 International Trade Administration. Ethiopia – Country Commercial Guide. [HERE](#).

Figure 1.3. 2020 emissions versus 2030 baseline (MtCO₂e)⁴³



Source: Staff elaboration based on Updated NDC (2021)

Accelerating implementation of development plans will also promote a low-carbon development pathway. The sustainable management of Ethiopia's land and forest resources not only improves soil productivity and local incomes, which strengthens resilience, it also increases CO₂ sequestration, contributing to lower net emissions. Tapping the country's vast low-carbon energy generation potential will not only help to meet the rising energy needs in Ethiopia, but also help green the transport sector, which is the key driver of poor air quality in cities, and help to decarbonize energy systems in neighboring countries through the export of hydropower and other renewable energies, and thus expand the country's export basket. Building on its vast natural resources and clean energy supply, Ethiopia can position itself as a resilient and green economy, which will help to bring in investments and strengthen international competitiveness.

-
- 43 There are evident discrepancies between the CAIT emissions data and the NDC data. Overall, the total emissions for 2020 are estimated by the NDC to be 66 percent more than the 2019 CAIT estimates. Higher emissions from LUCF and agriculture in the NDC compared to CAIT explain most of the discrepancies. The use of different models and assumptions could be one of the reasons for the discrepancies.



2

CLIMATE CHANGE COMMITMENTS ON MITIGATION AND ADAPTATION





Climate Change Commitments on Mitigation and Adaptation

2.1 Climate change targets and commitments

The GoE⁶ has indicated its strong commitment to tackling climate change by reducing emissions and building resilience through adaptation. Ethiopia was among the first low-income countries to submit an ambitious NDC in 2015. The NDC was updated in 2021 and pledged to limit the country's annual net emissions to 126 MtCO₂e or lower by 2030, which would constitute a 278 MtCO₂e (or 69 percent) reduction from the BAU scenario of 404 MtCO₂e (see Figure 2.1). The country has committed to achieving 20 percent of this scenario out of its own financial resources (unconditional scenario) and identified the need for international financial support to achieve the other 80 percent (conditional scenario). The NDC includes 15 mitigation commitments across agriculture, land-use change and forestry (LUCF), energy, waste and other sectors, with the largest reductions coming from LUCF (see Figure 2.2).

In June 2023, the government released its Long-term Low Emissions Development Strategy (LT-LEDS) to decarbonize seven priority sectors of Ethiopia's economy to achieve its net zero goal by 2050. As under the NDC, the largest emissions reductions under the LT-LEDS will come from the LUCF: specifically, the creation of a carbon sink in the land use sector through reforestation, afforestation, forest restoration, and reduced deforestation. Electrification of end-use sectors—such as transport, residential, commercial, and industry; replacing fossil fuels combined with expanding renewable power production; and reduction of livestock-related emissions using a range of interventions, such as increased productivity of livestock, have also been identified as key mitigation measures.

On adaptation, the NDC affirmed Ethiopia's commitment to mainstream climate change adaptation into development activities. The updated NDC provides details on implementing actions to address climate risks prioritizing 40 adaptation actions. The intention is to reduce vulnerability and contribute to an economic growth path that is resilient to climate change and extreme weather events. Specifically, the adaptation focus of the NDC is to increase resilience and reduce vulnerability of livelihoods and landscapes in three areas: drought, floods, and other cross-cutting interventions (related to disaster preparedness, risk reduction, response, and management).

2.2 The legal framework for climate action

The domestic legal basis for Ethiopia's climate change interventions is found in provisions in the Ethiopian constitution, as well as in various environmental, sectoral, and administrative proclamations, regulations and directives. Ethiopia does not have a dedicated climate change legislation that establishes a climate governance framework and obligations in law for the public and private sector. Instead, the legal and regulatory framework for climate change in Ethiopia is diffuse: the constitution and various environmental, administrative, and sector legal instruments contain measures that support and/or regulate the climate response of federal and subnational governments, the private sector, and development partners. The constitution includes provisions for the protection of the environment, the sustainable use of natural resources for the collective benefit of society, and the treatment of international agreements ratified by the country as a fundamental part of domestic law. The constitution also sets out the assignment of

expenditure functions between the federal government and regional government, including the assignment of significant subnational responsibilities in key climate change sectors like agriculture, health, transport and urban infrastructure. Similarly, while not all of Ethiopia's sector laws explicitly refer to climate change, most include relevant provisions that can be used to develop and enforce climate change regulations and standards, including through those on air pollution

Figure 2.1. Rising GHG emissions (MtCo₂e) and ambitious mitigation targets by source between 2020–2030

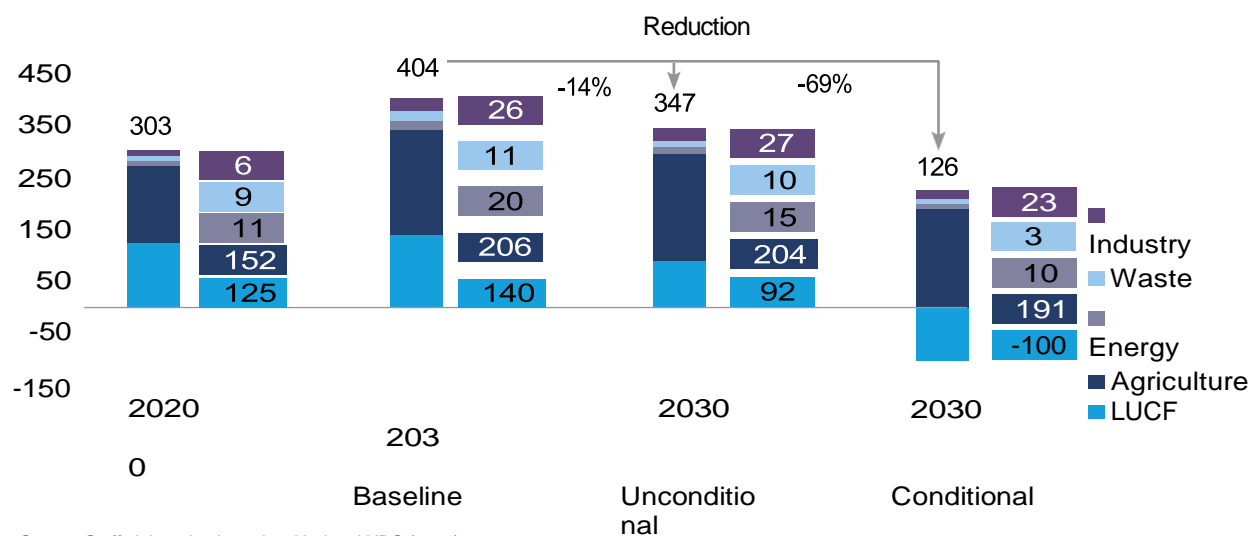


Table 2.1. Rising GHG emissions and ambitious mitigation targets

Sector		Unconditional (MtCo ₂ e)	Conditional (MtCo ₂ e)	Actions
LUCF		-48.4 (-35%)	-240 (-171%)	Sustainable agricultural land management practices; Reduction in pre-harvest losses; Carbon sequestration in grasslands; Lowlands Livelihood Resilience Project; Fuel switch and biomass efficiency (improved cookstoves); Reforestation; Landscape restoration
Agriculture	Livestock	-1.9 (-1%)	-14.8 (-8%)	Enhancement of livestock productivity; Agricultural mechanization; Increase in the share of poultry
	Managed soils	-0.1 (-1%)	-0.4 (-4%)	Oilseed feeding to reduce emissions from enteric fermentation; Use of organic fertilizer and crop residues
Energy		-5.1 (-26%)	-10.5 (-53%)	Energy efficiency; Transport electrification; Public transport expansion; Industry fuel switch
Industry		1.2 (+5%)	-3.5 (-13%)	Clinker substitution in cement
Waste		-2 (-17%)	-8.6 (-75%)	Reduction of waste per capita; Waste separation and composting; Wastewater management
Total		-56.2 (-14%)	-277.7 (-69%)	

Source: LT-LEDS taken from the Updated NDC (2021)

management; forest and land conservation and management; water resources management, protection, and conservation; energy efficiency and conservation; and disaster risk management. Various administrative laws that provide the legal framework to translate public policies into budgets and implementation also provide a space to address climate concerns. The Public Investment Management Guidelines, for example, prepared by the Ministry of Planning and Development (MoPD) under Proclamation 1210/2020, directly require the assessment of climate change risks. The Federal Public

Procurement and Property Authority (FPPA) updated the country's procurement laws (2023), which is at the approval stage by parliament and includes the provision for the application of green procurement considering green procurement recycling;

whole life-cycle cost analysis when developing specifications; preparation of evaluation criteria in the bidding documents; and defining terms and conditions of contracts as well monitoring of contract performance. The FPPA has also developed a note for the implementation of sustainable procurement in Ethiopia (June 2023).

Some climate governance powers and duties have been established in the 2021 law—The Proclamation to Provide for the Definition of the Powers and Duties of the Executive Organs of the FDRE (Proclamation 1263/2021). Proclamation 1263/2021 vests responsibility to initiate laws, policies, and strategies on climate change, as well as to coordinate, support and follow up on climate change activities, in the MoPD. Previously these powers were with the federal body responsible for the environment—the Environmental Protection Authority (EPA), under the new administrative structure. The Proclamation also vests the MoPD with oversight over the EPA. The shift to the MoPD was motivated by the need to include key adaptation ministries, such as Health, Labor and Social Affairs, and the Ethiopia Disaster Risk Management Commission (EDRMC) in climate policy decision-making processes, and to locate climate change coordination responsibilities in a federal institution with a clear mandate for coordination. Proclamation 1263/2021 also assigns specific important climate-related sector powers and duties at the federal level in the transport, agriculture, water, and energy sectors, and on disaster risk management to sector-specific federal public bodies.

There are however critical gaps and overlaps in institutional mandates in this anchoring of climate priorities in the national legal framework. For example, the Environmental Pollution Control Proclamation (300/2002) authorizes the EPA to establish and enforce air quality standards and authorizes the regions to establish more (but not less) stringent standards than the national standards. But EPA has not issued national standards since 2003. Tighter standards are needed to tackle local air pollution and greenhouse gas emissions from transport, residential, and industry sectors. As another example, the Environmental Impact Assessment (EIA) Proclamation (299/2002), in place since 2002, makes no reference to climate change. While some GoE stakeholders view the EIA Proclamation's references to the environment as sufficiently broad to include climate change, such an interpretation would be more effective and enforceable if spelled out in an amendment to the proclamation, implementing regulations, or a revision of sector-specific EIA guidelines to explicitly require environmental and social impact assessments for public and private investment projects to consider their greenhouse gas emissions and resilience to climate change. In addition, NDC priorities and targets are not anchored in national laws such as proclamations or regulations but are articulated in climate strategies, plans, and global commitments that are not legally binding and enforceable.

2.3 Policies, strategies, plans for mainstreaming climate action

Ethiopia has been an early mover amongst LICs in committing to a green development path, and has adopted a series of policies, strategies, and plans to guide its climate interventions. Ethiopia's climate-specific strategies, and global commitments and communications can be organized into three phases. In an early phase (1994–2007) Ethiopia ratified the UNFCCC (1994) and Kyoto Protocol (2005), and started assessment of its climate risks and the development of priority responses such as the National Adaptation Programme of Action (NAPA) 2007. A middle phase (2010–2015) saw the emergence of the Climate Resilient and Green Economy (CRGE) strategy, central to the evolution of Ethiopia's climate response and prioritization of sectors for inclusion in climate coordination mechanisms, capacity development, and investment. Sector climate strategies followed for three of the sectors identified in the CRGE as central to the green economy by the close of 2015 (agriculture and forestry; energy and water; and transport). In the latest phase (2017 to date), cross-cutting and sector strategy

development accelerated, with the development of further sector strategies (e.g., health, urban development and housing), a first cross-sector adaptation strategy (the National Adaptation Plan or NAP in 2019), the updated NDC in 2021 and finally, Ethiopia's LT-LEDS in 2023.

Adaptation, however, has only relatively recently been prioritized in Ethiopia's climate change policy response, despite being the most pressing climate issue for the country. The GoE has acknowledged that the prioritization of mitigation over adaptation since the early 2010s has been a failing in Ethiopia's climate response.⁴⁴ The adoption of the NAP in 2019 represents the first significant effort to promote and plan for adaptation as a cross-sector climate priority. The sector strategies, which fully incorporated adaptation, were more balanced but were limited to CRGE sectors. The early NAPA and EPACC (2010) were adaptation-oriented instruments, based on an assessment of climate risks to the economy, livelihoods, and health. However, these documents were focused on prioritizing projects for investment, rather than setting the strategic direction of adaptation actions. The NAP (2019) sets a programmatic, multi-sectoral, and long-term planning approach to adaptation, and seeks synergies with other development plans.

Ethiopia's national development plans and sector strategies have increasingly integrated climate change, though important gaps remain. The First Growth and Transformation Plan (GTP I 2010–2014) recognized climate change mitigation and adaptation as the key objective of the environment and climate change cross-cutting sector, and as a central issue for the agriculture sector. GTP II (2015–2020) established CRGE implementation as the objective of the climate and green economy pillar of the plan. Climate change was mainstreamed in the agriculture and rural transformation, and watershed and land management policy matrices, but not in the health sector matrix. The current 2021–2030 Ten Years Development Plan (TDP) identifies the building of a climate-resilient green economy as a “strategic pillar,” and mainstreams adaptation to climate impacts in other sectors like health. The chapter on environment and climate change targets biodiversity and emissions reduction, but without specifically referencing the CRGE, NDC, or NAP and with lower MtCO_{2e} targets than in the updated NDC. However, the 2020 Home Grown Economic Reform Agenda does not reference climate change impacts on the economy or green growth at all, despite seeking to address shortcomings in Ethiopia's economic growth strategy through structural transformation and investment in sectors like agriculture and energy. Similarly, most, but not all sector strategies integrate climate adaptation and mitigation objectives.⁴⁵ More importantly, climate objectives in sector strategies are not always in strong alignment with sector objectives in climate strategies. For example, the transport sector components of Ethiopia's LT-LEDS (2023) target shifting from petroleum to hybrid and electric vehicles, regulating vehicle age limits, and enhancing mass transport. The objectives and measures in the Ethiopia Transport Master plan and Strategy (published in 2022) do not mention vehicle types or age limits, and while it also prioritizes public transport, it targets regulatory frameworks and comprehensive measures through the adoption of Sustainable Urban Mobility Plans. These objectives are not mutually exclusive, but fragmented priorities in an environment of scarce technical and implementation capacity are not conducive to well-sequenced implementation.

2.4 Institutional structure for implementation and coordination

Ethiopia's critical political leadership and commitment to address climate change is evident. Climate change is an explicit political priority for the federal government and an explicit priority for the Prime Minister. This translates into climate change being treated as an important consideration by government actors.

- 44 See for example: GoE. 2020. Ethiopia's Climate Resilient Green Economy (CRGE) Strategy (2011–2019) – Implementation Progress Assessment Report, p1; and GoE. 2022. Third National Communication to the UNFCCC.
- 45 For example, the 2010 Agriculture Sector Policy and Investment Framework (2010–2020) targeted climate resilience and mitigation in the sector to a significant extent; the 2017 Agriculture Extension Strategy recognizes climate change as a threat to smallholders and targets building their resilience. The current education sector strategy recognizes climate change as a cross-cutting issue (Education Sector Development Programme VI, 2020–2025). The current health sector strategy, however, does not refer to climate change as a challenge in the sector. The National Health Adaptation Plan to Climate Change (H-NAP) 2017 filled this gap, but is not referenced in the current health strategy.

2.4.1 Climate change institutional and governance structures

Ethiopia has established a multi-level and multi-sector coordination structure to facilitate the implementation of the CRGE and support resource mobilization. At the federal level, the CRGE inter-ministerial coordination committee was established, chaired by the Prime Minister. The committee is supported by a management committee chaired jointly by the MoPD and the Ministry of Finance (MoF). These committees meet, although not as regularly as envisaged. Public bodies in charge of the key CRGE sectors are the institutional members of both committees. Similarly structured regional, woreda and kebele committees have also been established for inter-sectoral coordination at these different levels. The CRGE Facility was established to provide support on CRGE coordination, implementation, monitoring, evaluation, and climate finance, and within CRGE federal ministries, CRGE units were created to direct and coordinate CRGE strategy implementation within sectors. This structure has facilitated the implementation of the CRGE strategy. For one, it has supported the establishment of a dedicated facility to develop climate finance project proposals and manage climate finance, which in turn has helped Ethiopia access climate finance. According to the Climate Policy Initiative, Ethiopia attracted 6 percent of total climate finance flowing into Africa, making it the fifth-largest recipient on the continent.⁴⁶

The inter-ministerial coordination structure has however focused on CRGE implementation, rather than coordinating climate response more broadly, with some resultant shortcomings. For one, the various committees have paid insufficient attention to adaptation objectives. Second, as a result, key social sector institutions such as those in charge of health, labor, and social welfare issues have not been included. The EDRMC, though consulted, is not a formal member of the coordination structure. As a result, the EDRMC has its own guidelines for sectors, regions, and woredas on managing climate risks, which overlap with CRGE and NAP mainstreaming guidelines and instructions. Furthermore, work by the EDRMC to establish disaster risk profiles at woreda level has not been leveraged effectively into climate change planning at these levels. The lack of effectiveness of subnational committees has also been raised as a concern, as has the lack of representation of subnationals in the federal coordination structure. Finally, Proclamation 1263/2021 is silent on these CRGE institutional and governance arrangements.

2.4.2 Localization of the climate change agenda

Ethiopia has developed functional early warning systems related to climate risks, managed from woreda level upwards by the EDRMC. These systems provide timely and accurate information about potential disasters, such as floods, droughts, and epidemics. Currently, the country is in the process of digitizing processes to integrate up-to-date climate hazard information with risk analysis. It has also in recent years increased the number of weather stations.

A number of measures have been implemented to support the mainstreaming of the climate agenda at the subnational level. The Woreda CRGE Mainstreaming Guidelines, updated in 2019, for example, provide detailed guidance to woredas for mainstreaming climate change into their multi-annual development and annual operational plans. The guidelines incorporate both resilience and green economy planning, referencing the CRGE, the NDCs, and the national NAP, and direct woredas to assess localized climate hazards and the vulnerability of sectors and communities, based on EDRMC woreda Disaster Risk Reduction Profiles. Technical support has been provided to subnational governments to apply the guidelines and undertake climate-relevant development planning. Important institutional advancements have been made by some federal ministries to promote vertical coordination. The Ministry of Water and Energy (MoWE) and the Ministry of Agriculture CRGE units have

respectively established and are planning to establish a coordination forum with regional bureaus to strengthen mainstreaming of sector climate agendas at subnational level. The MoWE CRGE/INDC implementation framework also spells out subnational roles and reports on implementation by these agencies.

46 Climate Policy Initiative. 2022. Landscape of Climate Finance in Africa. ([HERE](#)).

Despite these efforts, the climate change agenda remains largely centralized. Because national cross-cutting and sector strategies often do not assign roles explicitly to regions and woredas, strategic capacity for climate change at subnational levels is very low; and since regions have very limited finances, subnational governments do not play a significant role in climate change. Some issues, such as the lack of technical capacity and finances, affect development planning and implementation more generally. There are however climate-specific aspects, such as lack of knowledge on the impact of climate change on communities and farmers; and insufficient understanding on what effective state responses are, that are holding back subnational governments from acting. Shortfalls are worse at the woreda level, where it becomes more important as issues such as changing local crop production; livestock and land management and conservation practices; local infrastructure climate-proofing; and local household behavioral change and readiness, all fall under their purview.

2.4.3 Monitoring of climate change

Ethiopia has established arrangements for reporting on UNFCCC commitments and CRGE strategy implementation, but implementation can be strengthened.

Reporting arrangements include the establishment of a monitoring, reporting and verification (MRV) unit and online database in the EPA, a CRGE registry in the CRGE Facility, and quarterly intra-sector and annual cross-sector CRGE implementation reports. In practice, the arrangements are only partially implemented. As acknowledged by the GoE, "... The specific quantifiable impacts of climate change interventions (in terms of GHGs reduced or avoided, and in terms of adaptive capacity built and vulnerable households or individuals reduced) in the country are less discernible due to the absence of necessary tracking mechanisms, M&E systems, MRV protocols, consistent indicators, and lack of documentation."⁴⁷ As highlighted above, the absence of coherent and public climate results frameworks is a critical gap both for consistent strategy development and for monitoring and reporting purposes. The development of updated NDC sector frameworks, in similar formats across sectors, appears to be a step in the right direction.

2.5 Mainstreaming climate change into public expenditure management

2.5.1 Integrating climate into budget management

In recent years, Ethiopia has made progress on integrating climate change into public finance management. As noted, climate change has been integrated into many national, sector, and subnational development plans, and the federal program-based budgeting system ensures that all budget proposals and allocations are based on ministries' strategic plans. In addition, flood and drought risks have been incorporated into Ethiopia's new fiscal risk model and fiscal risk statements, and starting with the 2023/24 budget, MoF will be tracking climate expenditure through a tagging system in the federal capital budget (see Box 1). This system can be key to mainstreaming climate in domestic public budgets and tracking expenditure reliably, provided that good capacity is developed to determine tags and use the information in budget decision-making processes.

47 GoE. 2019. CRGE Implementation Progress Report, pg.9.

Box 1: Climate budget tagging in Ethiopia

The GoE sees the implementation of a climate budget tagging (CBT) system as critical to attract more external financing and track climate strategy implementation. CBT in Ethiopia will count expenditures as climate spending when they finance activities implementing federal climate change strategies or activities that count as climate adaptation and mitigation according to the definitions used in the OECD DAC Rio Markers for Climate. The CBT system will only assess capital budgets (i.e., projects) of ministries, except where a program is principally for climate change, in which case all program expenditures will be tagged. The CBT system was tested on the 2022/23 budgets of selected CRGE ministries. Guidelines for use have been prepared, and in late 2022 the State Minister of Fiscal Policy and Finance signed a directive to pilot the system in eight federal public bodies in the agriculture, water, energy, environment, urban development, and disaster risk management sectors.

However, general weaknesses in the budget preparation and public financial management systems are preventing effective response to climate change priorities. Overall, the system allows for a lot of flexibility for the national and subnational finance ministries and spending bodies, with implications for quality of expenditure planning and achievement of expenditure and strategic plans. Some of the key weaknesses include: lack of strategic resource allocation; lack of a fully functional integrated financial management information system (IFMIS) and program-based budgeting at the subnational levels; poor predictability of capital budgets for public bodies; and a general lack of fiscal transparency and therefore accountability for achieving financial and non-financial results of public bodies. Also, climate change is yet to be integrated into the macro-fiscal model underlying the Macro-Economic and Fiscal Framework. Furthermore, differential climate change risks are not considered when deciding medium-term sector expenditure shares and ceilings in the medium-term fiscal and expenditure frameworks.

2.5.2 Climate change in intergovernmental fiscal transfers

Climate change concerns have not been integrated into Ethiopia's intergovernmental fiscal transfer mechanisms. The federal government collects the bulk of the revenue, greater than its expenditure responsibilities. Subnational budgets and climate change project-specific transfers from the federal level are the main sources of climate finance at subnational levels.

Climate change considerations are not used to determine the size of the block grants to regions. Article 77 (3) of the constitution assigns the power to the Council of Ministers to decide the total annual allocation of the general-purpose block grant to the regions. The medium-term fiscal framework, which is used to propose and discuss the division, does not integrate climate considerations. Also, there is no independent institution that assesses the revenue and expenditure assignment between the federal government and the regions to make a recommendation on the vertical fiscal devolution, as is the case in other fiscally decentralized countries. The size of the grant is instead determined based on political considerations.

The differential climate change expenditure needs of the Regions are not considered in determining regions' share in federal block grants. The current formula, which is determined by the House of Federation (HoF), which is the upper house of Parliament, has been in place since 2017 (see Box 2), and does not include considerations for climate change. The previous HoF block grant formula (2012) did include an assessment of environmental protection needs based on proxy indicators (including Productive Safety Net Programme recipients), in recognition of the low expenditure on and high importance of environmental protection. While environmental protection is not equal to climate resilience, such inclusion would have had some climate-positive effects on the distribution of finance. However, in implementation it became clear that the indicators to indicate the differential expenditure needs of regions were not functional. The lack of better systematic data—for example on land

areas that need protection—for better indicators resulted in the sector being dropped as a factor in calculating the formula. Other countries have built in climate considerations into their inter-governmental fiscal transfer mechanisms to incentivize climate action (see Box 3 for an example from India).

Box 2: Horizontal fiscal devolution formula in Ethiopia

The formula uses the difference between revenue-raising potential and the expenditure needs of the region. Assessment of revenue potential is based on historical indicators rather than the actual tax base. Similarly, the expenditure needs assessment is based on various proxy indicators. Expenditure on education is calculated based on school-going population between the ages of 7 and 17, and expenditure on agriculture on rural population. Regional block grants to woredas are distributed by similar formulas calculated at the regional level. Regional Councils determine the woreda block grants. A second semi-conditional grant (the Sustainable Development Grant or SDG) is distributed using the same formula and is loosely earmarked for sectors. Currently it is earmarked for urban development and infrastructure; previously it was earmarked for

Box 3: Intergovernmental fiscal transfers support climate action by India's states

The Finance Commission in India is constitutionally mandated to recommend the vertical and horizontal division of taxes collected by the Union Government to and between India's states. Finance Commissions are appointed every five years, to adjust the system of transfers for the coming five-year period. Horizontal division of revenue is based on objective criteria of need, equity, and performance. Since the 9th Finance Commission (1989–1995), which first recommended a disaster relief fund for each state, rule-based determination of the division of revenue has included allocations for disaster risk management, environmental management, and climate change mitigation and adaptation when determining total funding to states. Over time, the disaster relief provisions have been refined, and provisions made to finance maintenance of states' forest cover and compensate states for the opportunity cost of keeping areas under forest; to promote clean energy and efficient use of water; to promote clean air in cities and properly manage solid waste and sanitation; and to facilitate nutritious food production and groundwater augmentation.

2.5.3 Climate in public investment and expenditure management

Ethiopia has demonstrated progress in establishing a climate-smart public investment management (PIM) system for new assets at the federal level. In accordance with the Federal Government Public Projects Administration and Management System Proclamation (1210/2020), since the 2022/23 budget all proposed federal projects have had to go through a process of project concept note (PCN) development, pre-screening, and for large projects, project feasibility studies and independent appraisal. The accompanying new PIM guidelines include climate risk assessment and mitigation in project screening and appraisal processes, and MoPD has established a separate PIM directorate with project screening and appraisal capacity.

The PIM system can be further strengthened to increase the climate resilience of public investments. The PIM guidelines are still largely untested, and coordination between the MoF and MoPD on approval and financing of development projects is yet to be established. Budget process mechanisms, such as project-selection criteria to ensure that positive climate change policy objectives are considered specifically, are not established. Furthermore, the guidelines incorporate climate risks into only some of the proposed processes for project planning, appraisal, and implementation. Climate risks are not made explicit in guidance on project adjustment reappraisal and evaluation, for example. The governance models for state-owned enterprises only very partially include climate change considerations, mostly through EIA requirements and social responsibility obligations. These limitations should be addressed along with explicitly including climate risks in the list of design risks that need to be considered in the project risk management plans.

Climate change is as yet not incorporated into the management of public assets, and climate co- benefits of public procurement have not been explored. The Federal Government Procurement and Property Administration Proclamation No. 649/2009, and Directive No. 9/2010 outline the legal and regulatory framework for management and disposal of fixed assets and require that public bodies keep asset registries. There is however no requirement for climate risk, and so, while public bodies keep asset registers, there is no practice of these registers recording critical or at-risk infrastructure/assets. Records on the usage and age of assets are also not complete. The public procurement legal framework provides for value for money procurement and the use of performance or functional criteria, but does not assign any weight to green bids and to expenditures that would build resilience.

2.5.4 Public accountability for climate expenditure

The Office of the Federal Auditor-General (OFAG) recently introduced environmental audits, which is a positive development for strengthening implementation of Ethiopia's climate change agenda. The OFAG undertakes performance audits, which may be of specific projects or cross-cutting issues, such as the implementation of guidelines to mainstream climate change. Recently, the OFAG established the environmental audit directorate, with specialized officers, such as environmental specialists and engineers, working alongside audit professionals. This unit audits, for example, the environmental impact of projects, and the effectiveness of forest management and waste management practices of federal bodies, and would be in a position to evaluate the effectiveness of the climate change agenda. The OFAG's mandate is however limited to the GoE, and regional environmental and performance audit capacities are less well developed.

Public accountability for climate expenditures nonetheless needs to be strengthened. Parliamentary scrutiny of federal ministries' implementation of climate proposals is weak, largely due to lack of systematic information on spending and performance. The House of Representatives has a standing Climate Change and Environment committee, which scrutinizes Ethiopia's climate proposals, but this committee has limited research support and only a limited role in the scrutiny of the budget and its implementation by the House. Public access to climate data and on the implementation of Ethiopia's climate strategies and commitments is virtually nonexistent, which limits meaningful participation in climate stakeholder engagements.



3

SECTORAL IMPLICATIONS OF CLIMATE CHANGE IN ETHIOPIA



Sectoral Implications of Climate Change in Ethiopia

To understand the potential impacts of climate change across Ethiopia's economy, detailed modeling was conducted, with climate scenarios chosen to reflect the large uncertainties. As noted in Section 1, while there is consensus that mean annual temperatures will rise in Ethiopia, projections of future precipitation vary significantly. A subset of six climate scenarios was thus chosen for further analysis, reflecting a wide range of possible temperature and precipitation patterns: these include three dry/hot scenarios, and three wet/warm scenarios, all selected from the SSP2–4.5 and SSP3–7.0 ensembles.

Development plays a key role in building resilience, and policy scenarios were selected to model the interaction of development and climate change. Development and resilience are closely intertwined. Development can lessen reliance on climate-sensitive sectors like agriculture, free up resources to manage risks, and aid adaptation. However, it can also heighten vulnerability through environmental impacts and displacement. Development as usual will therefore not suffice. Countries typically need additional policies and investments to adapt and increase the likelihood that they reach their development goals in a changing climate. Three policy scenarios were therefore selected to understand the interplay of climate change and development in Ethiopia: (i) Constrained Growth (CG), which defines what the economy would look like leading up to 2050 if Ethiopia continues on a growth trajectory similar to recent decades without accelerating structural reforms or implementing climate actions; (ii) Reform (REF), which represents a future where structural reforms unleash productivity growth and structural transformation but still without climate actions, (iii) Resilient (RES), under which structural reforms are implemented along with adaptation actions to cope with the impacts of climate change.⁴⁸ The emissions trajectory of the different policy scenarios was also assessed, and where possible, the cost of mitigation estimated. To give a sense of these costs, a fourth scenario is also presented in Chapter 4, labeled the Green Economy (CRG) scenario. This scenario includes select mitigation measures in addition to structural reform and adaptation to achieve a low-carbon future for the country.

The sections that follow describe the actions that can be taken to build resilience to climate change and promote low-carbon development for natural, physical, and human capital, and within three economic sectors: agriculture, mining, and tourism. Models, where possible, are used to estimate the impacts of climate change and the effectiveness of adaptation and mitigation measures. Quantitative assessments are supplemented by qualitative assessments as needed.⁴⁹

3.1 Coping with climate impacts on water and land

At a first glance, Ethiopia's water resources endowment appears generous, yet Ethiopia faces serious water challenges that threaten the country's development, placing millions of people at risk. Ethiopia's annual renewable surface water resources amount to some 122 billion cubic meters (m³) per year in 12 river basins. Rainfall across much of the country is, however, exceptionally variable and unpredictable, both in time (within and between years) and space, and water scarcity is a reality in several parts of the country where 27 million people, or just above a fifth of the country's population, live. Six consecutive seasons of below-average rainfall have left some regions in Ethiopia

vulnerable to crop failures, livestock losses.⁵⁰

48 The policy scenarios are defined on the basis of current government plans and policies and those outlined in the HGERA. See World Bank. 2023. Ethiopia CCDD Background Paper.

49 Details on the assumptions and methodology used for the modeling analysis can be found in World Bank. 2023. Ethiopia CCDD Background Paper. It is important to note that an assessment of the impact of extreme events was beyond the scope of the CCDD and is left for future work.

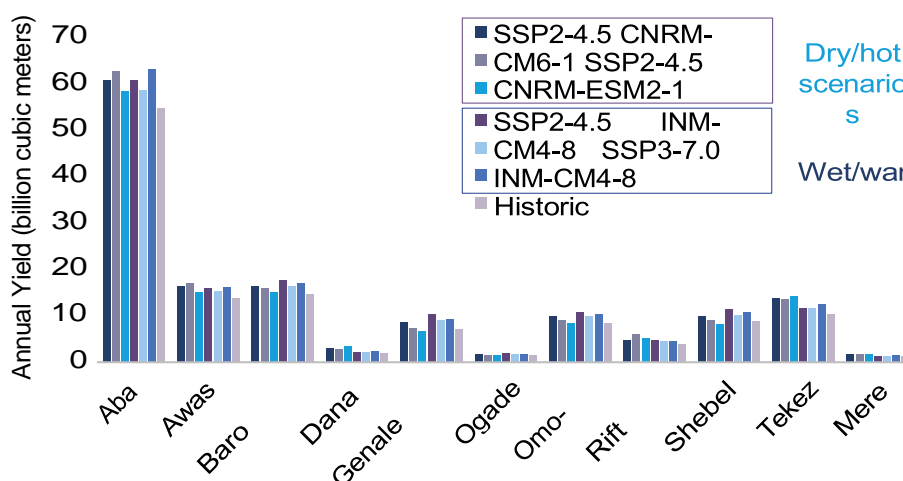
50 WRI. 2021. Balancing Water Demands and Increasing Climate Resilience: Establishing a Baseline Water Risk Assessment Model in

The government is implementing several reforms and investment programs to improve water resources management. Despite its water resources, Ethiopia has not invested sufficiently in storage and irrigation systems. Moreover, a fragmented information and knowledge base hampers efforts to manage water-related risks. In addition, the institutional set-up of the water sector has been in constant flux since a Water Resources Department was set up under the then Ministry of Public Works in 1956. Today, strong water management institutions are critical for Ethiopia's socioeconomic development, and some of the more recent priorities⁵¹ to improve water resources management include:

- Increase rural residents with access to 25 litres of water per person per day from 55 percent to 100 percent, increase urban residents with access to tap water from 59 percent to 100 percent; provide adequate wastewater management in urban areas; rural villages to have access to improved toilets;
- Expand coverage of medium and large-scale irrigation schemes from 490,000 ha to 990,000 ha and increase water use efficiency from 30 to 50 percent; increase the area under integrated watershed management from 2.25 million ha to 10 million ha.

Climate change will impact Ethiopia's water resources by increasing average water runoff across the country, while also affecting interannual variability. As noted, climate change will intensify rainfall variability in Ethiopia and also change the level of annual precipitation in the country. Modeling of climate change impacts in river basins shows a slight increase in average runoff across all six climate scenarios.⁵² These projected increases result in slight increases in mean annual runoff for 11 major basins, with wetter and drier areas seeing a similar level of increase (see Figure 3.1). The Ogaden basin, presently one of the driest, is expected to see the greatest gains from climate change, reaching up to 24 percent. At the same time, monthly and interannual runoff variability will also increase and could exacerbate water supply reliability issues (as discussed further below for irrigation and hydropower).

Figure 3.1. Average annual runoff by major sub-basins



Source: World Bank modeling results. Note: The six GCMs are differentiated based on dry/hot (cnrm) vs wet/warm (inm).
Note: For modeling purposes, two river basins were combined into one, making a total of 11 basins modeled.

Ethiopia; World Bank/GFDRR. 2019. Ethiopia Disaster Risk Profile.

51 Several plans are being implemented and revised. The National Water Resource Management Policy (1998) and the Water Sector Strategy (2000) are being amended with the aim of addressing gaps and improving alignment with the current development strategies. The National Hygiene and Environmental Health Strategy (2016–2020), Integrated Urban Sanitation and Hygiene Strategy (2017–2020), and School WASH strategy (2013–2020) have been endorsed and are being implemented. Urban Sanitation Project in 23 medium and large towns is under implementation and the Rural Sanitation Campaign 2024 strategy was

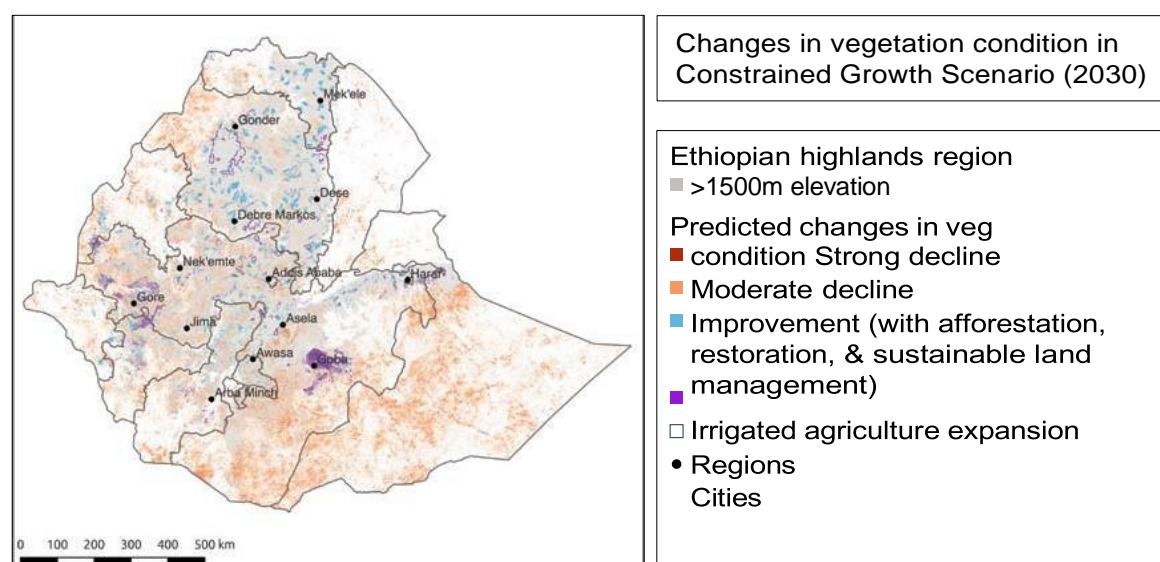
Country Climate and Development Report:

- prepared by the Ministry of Water and Energy and the Ministry of Health and resource mobilization is underway. The Ministry of Irrigation and Lowlands (MOIL) is developing a national irrigation strategy.
- 52 The DHI MIKE 11 rainfall-runoff module, NAM, is a lumped and conceptual catchment runoff model with continuous accounting of moisture content in subsurface zones. NAM was used to model climate change impacts on runoff at the 179 sub-catchment level, based on local topographic, soil, and land use gridded data in addition to monthly data on precipitation and temperature. These 179 catchments make up the sub-basin of the 11 major river basins of Ethiopia.

To cope with increased variability in annual precipitation, but also benefit from the additional runoff, adaptation measures will be needed and include:

- Increasing the efficiency and safety of existing storage and increasing the spectrum of multipurpose storage to mitigate and adapt to increased climate variability (by reducing impacts of floods and retaining water for productive use during dry spells).
- Integrated watershed management to increase groundwater recharge, reduce siltation in dams and reservoirs, enhance soil and water conservation, and better integrate different uses, including pastoralist livelihood systems.⁵³
- Interventions to reduce non-revenue water, improve demand management, and increase efficiency of water supply systems (reduce water production losses) to use finite water supply more conservatively; and promote wastewater reuse.
- Prioritizing irrigation modernization to improve irrigation efficiency and introduce new technologies to expand irrigation sustainably.

Figure 3.2. Changes in vegetation condition in the CG scenario (2030)



Source: World Bank modeling results

Land degradation remains a development challenge, though hotspots are projected to shift from the highlands to Ethiopia's lowlands. Recent LT-LEDS data show deforestation rates of almost 92,000 ha/year from 2000 to 2013 and over 38,000 ha/year from 2014 to 2020, the slowdown being due to an upswing in reforestation.⁵⁴ Modeling analysis for the CCDD projects that in the CG scenario another 122,000 hectares of forest would be lost by 2030. Land conditions are also projected to deteriorate, although with hotspots moving from highlands to the lowlands, reflecting the success of government's efforts to rehabilitate the highlands through extensive land management programs.⁵⁵ Figure 3.2 shows areas that are predicted to experience change in vegetation condition through 2030 under the CG scenario. Under this scenario, nearly 1 million hectares per year are projected to see declines in vegetation cover and condition, despite the government's ongoing investment in sustainable land management, afforestation, and landscape restoration in 4.1 million hectares. Highlands which were previously highly degraded—with 50 percent of the highland area having experienced significant erosion

⁵³ GoE. 2023. Long-Term Low Emissions Development Strategy, pg. 50.

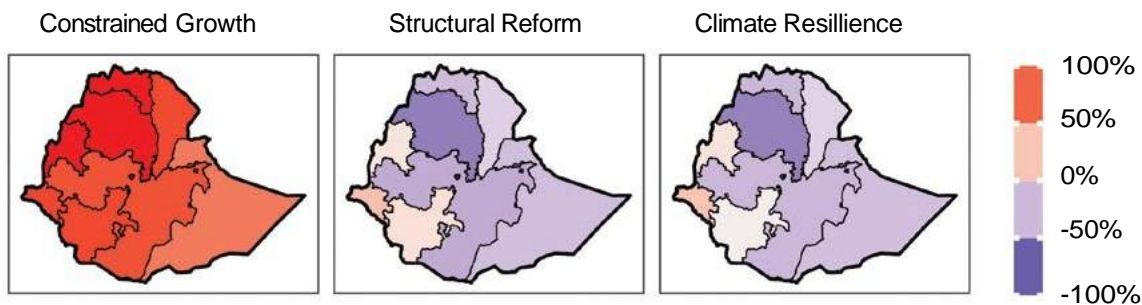
⁵⁴ GoE. 2023. Long-Term Low Emissions Development Strategy taken from the Environment, Forest and Climate Change Commission (EFCCC)

55 Ethiopia's Sustainable Land Management Program is one of the largest and most ambitious such programs globally. Over US\$1 billion is being invested in ongoing SLM activities covering over 4.1M hectares in 8000 highland watersheds.

by the mid-1980s—have witnessed improvements in areas targeted by recent government programs. However, large areas of the lowlands are now projected to be under threat from degradation. Such ongoing forest and land degradation substantially reduces agricultural and livestock productivity, affects hydropower output and water availability, increases flood risks, and also increases GHG emissions.

Improved land management will generate substantial development and adaptation benefits, and without the need for additional resources for adaptation but instead through improved efficiency of investment programs. Three scenarios were modeled to illuminate the role of landscape management in mitigating ongoing degradation trends: CG assumes a 1 percent rate of cropland expansion, with irrigation expanded to 1.5M hectares and only existing investment in sustainable land management (covering 4.1M hectares). The REF scenario assumes greater investment in the agriculture sector such that cropland expands by 2 percent per year and irrigation reaches 2.8M hectares, with correspondingly greater investment in sustainable landscape management that partially meets the country’s ambitious restoration goals.⁵⁶ The RES scenario is similar to the REF scenario, with no additional investments in land management, but rather than targeting investments in areas with high levels of degradation, investments are focused in areas with the greatest potential to improve ecosystem services (erosion control, water regulation, and carbon), improve landscape resilience in areas at greater risk from climate change, and maximize benefits to rural populations. The analysis shows that by 2050, increased rainfall due to climate change under the CG scenario (with widespread land degradation) will reduce crop yields, ranging from 1 percent to almost 5 percent for different crops, as nutrients are washed away with soils. Land management investments under the REF scenario, however, reduce crop yield losses from erosion by half; improved targeting under the RES scenario reduces these losses by nearly 90 percent. Furthermore, healthy forests and other natural landscapes will significantly mitigate flood risks, as they can hold large amounts of water. Figure 3.3 shows that capital damage increases by 100 percent in some parts of the country due to climate change under the CG scenario (with significant land degradation and infrastructure built to withstand a historical 10-year flood by catchment). Damage to capital is substantially reduced under the REF scenario, with all new capital being built at a higher design standard based on the current 20-year event instead and an additional 6.7M hectares of land restoration investments in highly degraded ecosystems.⁵⁷ Improved targeting based on the same restoration goals reduces capital damages further, particularly in the SNNP region in the south (Figure 3.3 – right panel), an area also projected to see the highest increases in rainfall due to climate change. Land restoration and management practices planned as part of existing government programs, if implemented, will therefore bring development benefits and also strengthen resilience. Even greater benefits can be achieved by aligning existing strategies and targets to prioritize investments in areas that maximize the potential for ecosystem services returns and the potential to offset climate risks for rural populations, with little additional cost.

Figure 3.3. Change in inland flooding capital damages by state by 2050, relative to 1995–2020 baseline



Source: World Bank modeling results. Note: SSP3–7.0 ensemble mean, 20-year flood.

56 In 2016, the country pledged to restore 15 million hectares of degraded landscapes by 2030 as part of the African Forest Landscape Restoration Initiative (AFR 100). This study assumes a more conservative implementation of landscape restoration under the REF scenario, simply meeting the country's NDC commitments of 2.7M hectares afforested and 4M hectares restored by 2030 (5.1M hectares afforested and 12M hectares restored by 2050).

57 Priority ecosystems identified in Ethiopia's LT-LEDS include moist evergreen Afromontane forest, dry evergreen Afromontane forest and grassland, Acacia-Commiphora woodland and bushland, and Combretum-Terminalia woodland and wooded grassland.

However, other reforms will also be needed—particularly related to land administration in pastoral lowlands and urban areas—to improve land management across the country. Ethiopia has made tremendous progress with land registration in the rural highlands (dominated by sedentary agriculture). From 1998–2010, regional governments issued over 22 million low-cost “first-level” land certificates, that incentivized land managers to invest in sustainable land management practices that in turn generated positive impacts for soil and water conservation, increased tree planting, improved productivity, and supported women’s empowerment.⁵⁸ Since 2013, over 25 million geo-referenced digital “second level” certificates have been delivered for US\$ 8/parcel. These certificates have enabled landholders to access over US\$ 80 million in micro-finance loans, led to investments in sustainable land management practices, and increased rural revenue collection by 15-67 percent.⁵⁹ This impressive scale was enabled by legal and regulatory reforms to streamline institutions and procedures, capacity development, political will, and fit-for-purpose, low-cost technologies, such as ortho-imagery. Ethiopia however needs to expand rural land registration to the pastoral lowlands. In the lowlands, pastoralists’ traditional communal land use rights and institutions remain weakly recognized and largely unregistered, which complicates the identification of who is vulnerable to shocks, who needs to be consulted on land use changes and investments, and who may need to be compensated in case of disasters. This informality can lead to land expropriation without proper compensation, involuntary displacement, and loss of access to vital dry-season grazing land and water resources, disrupting livelihoods and increasing climate vulnerability. It will thus be important to expand rural land registration to incorporate pastoralists’ rights and strengthen their customary land administration institutions in a manner that is grounded in localized understanding of social dynamics and drivers of fragility. In addition, to facilitate structural transformation and inclusive, climate-resilient urban growth, Ethiopia also needs to accelerate urban land regularization and registration, learning from its successes in the rural highlands. Urban dwellers and cities face many barriers to rights formalization, including costly, lengthy, and redundant procedures (due to separate regularization and registration institutions) that do not reflect the rural highlands innovations. As a result, most urban land transactions are informal, and only 12 percent of urban parcels are registered.⁶⁰ Informal settlements cover an estimated 74 percent of urban areas.⁶¹ With these settlements encroaching into wetlands, flood runoff and other hazard areas, the urban poor, forcibly displaced and other vulnerable groups – who often occupy these areas – are increasingly at risk of climate-related events.⁶² Without legal land rights, residents cannot access basic services, such as electricity and water, and it is difficult to identify them as disaster victims.⁶³ Further, the inadequately planned expansion of built-up land and loss of green areas reduce carbon sinks and reinforce urban heat island effects. There is an urgent need to integrate urban land regularization and registration and adopt more inclusive and fit-for-purpose urban land administration procedures. In the medium term, Ethiopia will also need to integrate and formalize rural and urban land administration to meet its development and climate change objectives.

3.2 Making agriculture more productive and climate-resilient

Agriculture is Ethiopia’s largest economic sector and faces significant constraints that are holding back sector transformation. Agriculture accounts for more than 80 percent of exports, employs about 64 percent of the workforce, and makes up 38 percent of GDP.⁶⁴ Ethiopia also has the largest livestock population in Africa. Despite efforts to improve agricultural productivity with some success, systemic

58 Holden, S., K. Deininger, and H. Ghebru. 2009. “Impacts of low-cost land certification on investment and productivity.” *American Journal of Agricultural Economics* 91(2): 359–373.

59 Michel, M. 2018. Business Case for the Rural Land Administration Information Services. Land Investment for Transformation, Addis Ababa, Ethiopia.

60 World Bank. 2019. Unlocking Ethiopia’s Urban Land and Housing Markets, Synthesis Report.

- 61 FDRE, Ministry of Urban Development and Infrastructure. 2021. Urban Planning and Land Reform Project Feasibility Study.
- 62 Abraha T. et al. 2022. "Rapid Urbanization and the Growing Water Risk Challenges in Ethiopia: The Need for Water Sensitive Thinking." *Frontiers in Water*, Vol. 4, June 2022, p.890229.
- 63 GoE. 2021. Ministry of Urban Development and Construction. Draft Revised Urban Policy, June 2021.
- 64 World Bank. 2021, 2022 World Development Indicators on Agriculture Export (2021); Employment in agriculture data (2021), and Agriculture share of GDP (includes forestry and fisheries) data (2022). Accessed on 26 October 2023.

constraints hinder the sector’s transformation,⁶⁵ including a scarcity of improved seeds, and high reliance on rainfed agriculture with only 0.5% of total agricultural land currently irrigated.⁶⁶

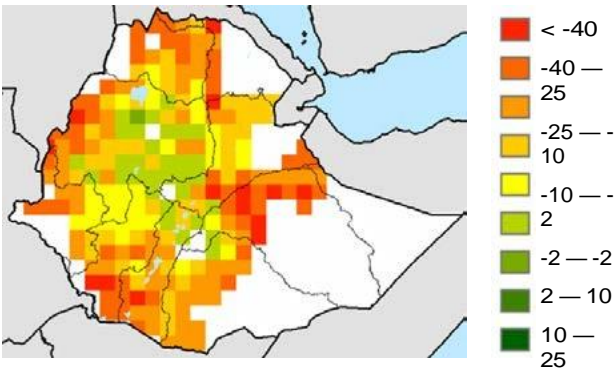
The government has renewed its emphasis to develop the agriculture sector and ensure food security, through several sustainable agricultural initiatives. Ambitious plans and targets are outlined in the 10YNDP (2020–2030), the 10-year Master Plan for the Agriculture Sector (2020–2030) and the Revised Agriculture and Rural Development Policy (2020). A variety of policy reforms and investment programs have been identified in the HGERA to achieve the sector transformation, and include:

- Increase the access of farmers and pastoralists to innovations, services, and modern inputs (e.g., seeds and breeds) through improving quality of research, extension and advisory services, veterinary infrastructure, etc.;
- Develop competitive agricultural value chains by establishing linkages between farmers, input suppliers, and commercial markets for agricultural commodities, products, and export markets;
- Expand the area of land available for irrigation from the current 580,000 ha to 1.4 million ha, including through encouraging private sector investment in irrigation infrastructure through public- private partnerships (PPP) and improving irrigation water management.

The modelling shows that climate change impacts on crop yield will vary by crop and region, and that not all impacts are negative. Table 3.1 shows the impacts on crop yields for six major Ethiopian crops and for different climate scenarios. Barley, teff, maize, and wheat yields are negatively affected in a dry/hot scenario. Teff is the only crop that decreases in a wet/warm scenario while all other crops increase in yield. Impacts also vary by region. Figure 3.4 shows yield changes for teff between 2001– 2020 to 2041–2060 under the average hot and dry climate models. Yields do not decline uniformly across the country; some regions in the highlands benefit from the impacts of climate change while the lowlands are negatively affected.

Table 3.1. Average change in crop yields under climate change from 2001–2020 to 2041–2060		
Crop	Climate effect (Dry/Hot mean)	Climate effect (Wet/Warm mean)
Teff	-5.5%	-2.8%
Maize	-1.5%	+1.3%
Sorghum	+2.9%	+3.1%
Wheat	-1%	+3.8%
Barley	-6.6%	+2.4%
Chickpea	+5.8%	+4%

Figure 3.4. Yield changes for teff, 2001–2020 to 2041–2060 under climate change

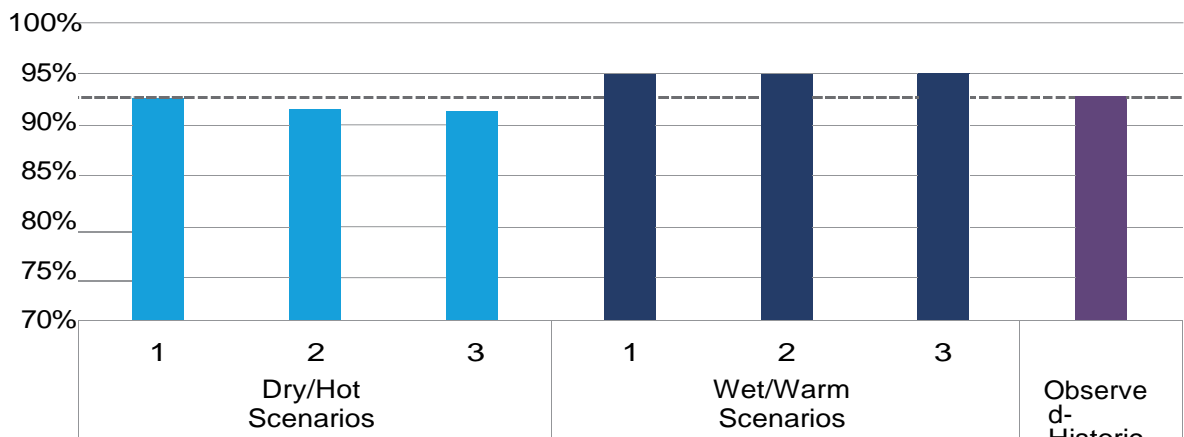


Source: World Bank modeling results. Note: Crop yields are also indirectly affected by changes in erosion due to climate change and the resulting topsoil. Generally, increased rainfall results in increased topsoil loss, as noted above in the context of sustainable land management. These impacts are not included in the results presented in Table 3.1.

-
- 65 Merga, Gemechis et al. 2023. "Welfare impact of improved maize varieties adoption among smallholder farmers in Amuru district of Horo Guduru Wollega, Ethiopia." *Cogent Economics & Finance* 11:1, Dec 2023, p. 2207923.
- 66 World Bank. 2020. Development Indicators, Agricultural Irrigated Land. [HERE](#).

Climate change will also affect irrigation water delivery, though marginally. Figure 3.5 shows how irrigation deliveries (defined as percent of the irrigation needs that are met) are projected to increase from 93 percent to between 94 to 95 percent under wet/warm scenarios, and decrease to 91 percent under dry scenarios, reflecting both the marginal increase in runoff and the increased variability of precipitation. It is important to note that this result depends critically on the assumption that irrigation needs are prioritized over hydropower. If instead the water needs of hydropower are prioritized, the percentage of irrigation water demand that is met drops to between 81 and 82 percent under Dry/Hot scenarios and between 84 and 87 percent under Wet/Warm scenarios.

Figure 3.5. Percentage share delivered of national irrigated water demand



Source: World Bank modeling results

However, overall impact of climate change on total crop production is not significant and is outweighed by the impacts of agricultural transformation programs, limiting the need for large adaptation investments. Figure 3.6 shows the change in the total crop revenues in Ethiopia under different climate and policy scenarios between 2021 and 2050. The model accounts for changes in irrigated land area, improved farm practices (fertilizer and improved seeds), changes in demand from growing populations and GDP growth for different agricultural commodities, and the possibility of trade to balance demand and supply.⁶⁷ Farmers also undertake autonomous adaptation by switching to more suitable crops based on climate conditions. The analysis shows that crop production increases significantly under the REF scenario when compared to CG. Climate change results in limited, generally positive effects on total production, with overall gains by the 2040s of 3 percent per year.⁶⁸ However, climate impacts by crop vary: for example, teff (15 percent production) drops by 4 percent under CG due to climate change.

67 The analysis uses the IMPACT-SIMM model, which is a multi-market agriculture sector model that maximizes total national consumer- producer surplus at the equilibrium by balancing supply and demand for 33 commodities via domestic production and trade (net exports). The model is spatially explicit on production by Food Production Units (FPU) with a single national demand. The FPU, the 11 major river basins, are linked to the water model to input irrigation water supply by river basins. The decision variables of the model are planted area each year for each of the 33 crops, rainfed and irrigated by FPU, and the amount of exports to

- meet demand/ supply balance. The model takes in world market prices as exogenous but domestic demand and supply as well as cropping areas are determined endogenously to meet domestic demand.
- 68 The emergence of new pests and diseases due to climate change such as the 2020–2021 locust outbreaks could increase as temperatures rise and there are changes in precipitation patterns. Assessment of such impacts was beyond the scope of the analysis.

Figure 3.6. Percentage increase in crop revenues

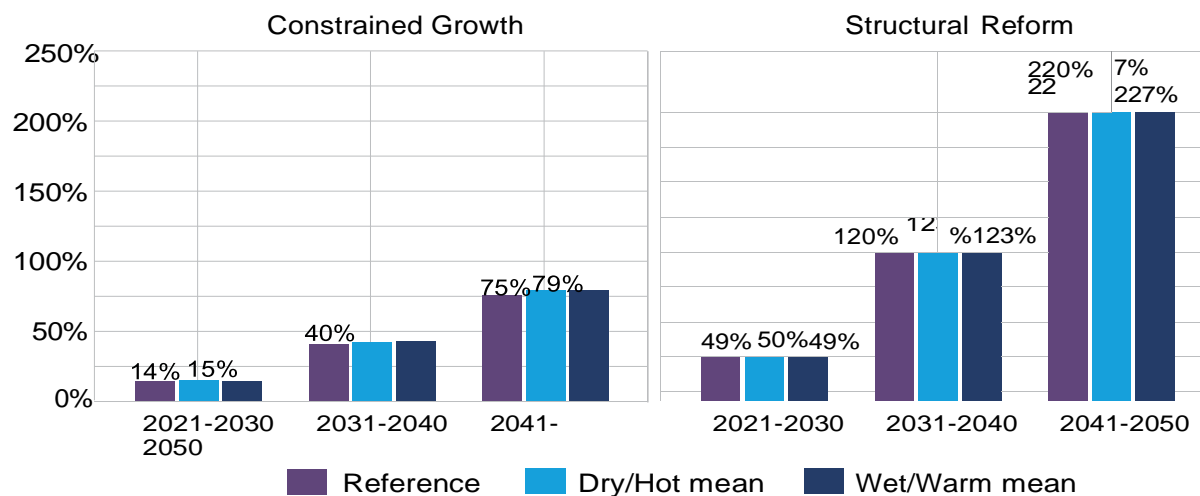
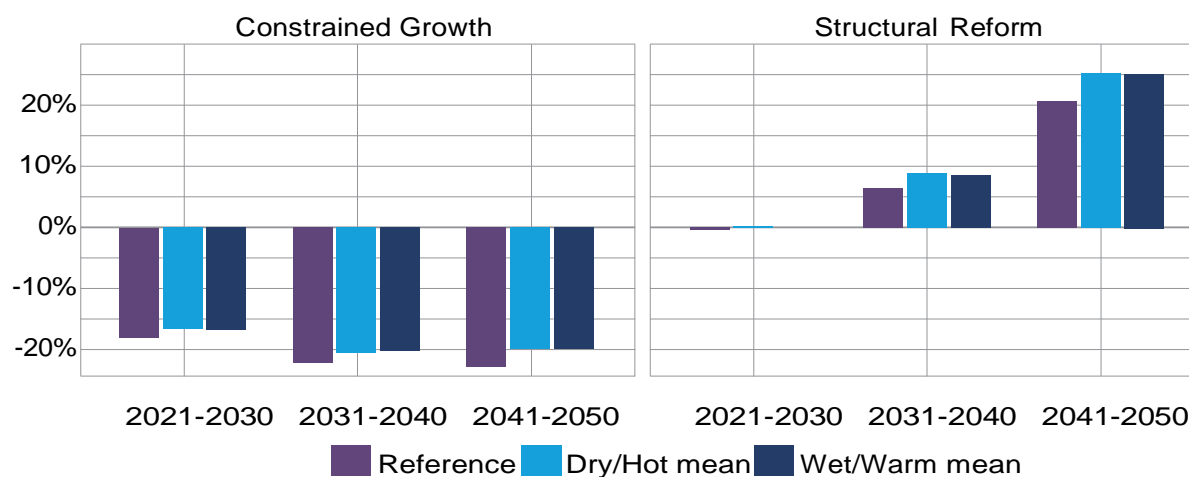
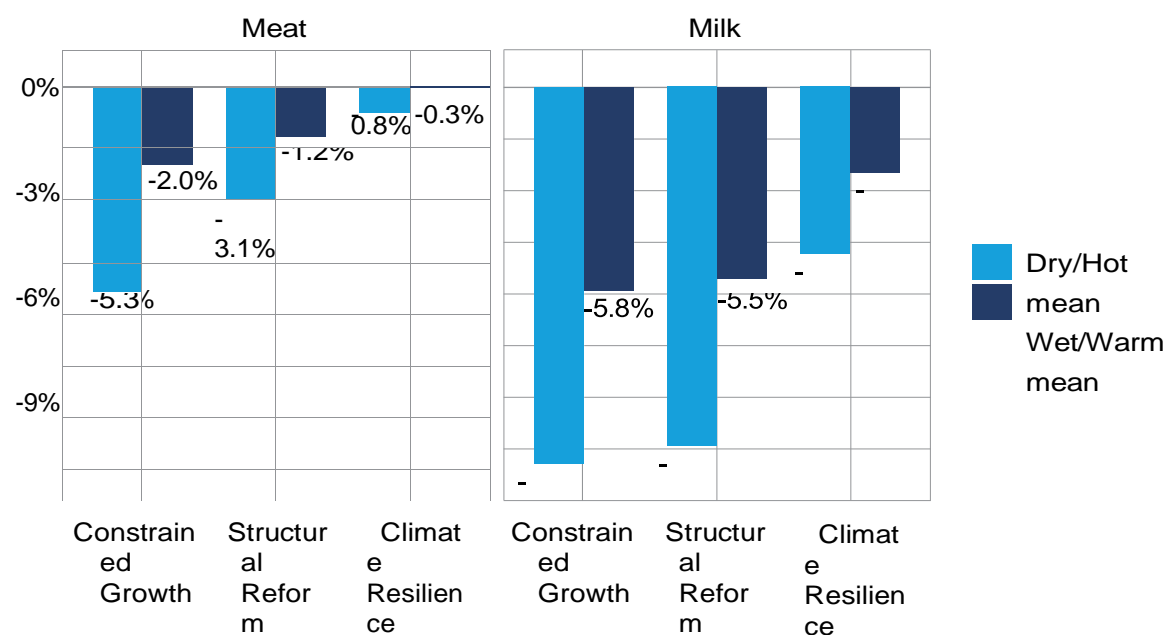


Figure 3.7. Net exports as a percentage of total demand



Source: World Bank modeling results

Figure 3.8. Climate impact on cattle production



Source: World Bank modeling results

Structural reforms similarly have important implications for the trade in agricultural commodities, but so does climate change. In Figure 3.7, under the CG scenario, increased domestic demand for agricultural commodities surpasses production growth, resulting in a negative balance and need for imports. Climate change does not have any significant impact on trade volumes under CG. Under REF, however, production growth surpasses increased demand after the first decade and results in a significant increase in exports from 2030 onwards. Climate change helps increase the trade surpluses, particularly after 2040, to 25 percent from 20 percent. Export of sorghum and root crops in particular increases due to the positive impacts of climate change on yields.

Climate change impacts on livestock production are more pronounced and highlight the need for adaptation investments. The analysis shows that a pessimistic (dry) future could result in livestock production losses of 8 percent and 7 percent in the 2040s under CG and REF respectively. Adaptation measures can reduce the overall impact to a loss of 6 percent. The largest climate impacts are in cattle milk and goat/sheep meat production. Cattle milk (39 percent of total livestock revenues) and goat/ sheep meat (31 percent) remain exposed even under a REF scenario (see Figure 3.8), and additional adaptation measures are needed to cope with the impacts of climate change.

Though the impacts of climate change at the national level are not negative other than for livestock, regional impacts could be negative and will require additional adaptation measures. Examples of how Ethiopia could do things differently include:

- Setting priorities for agricultural research and development based on forecasting of how climate stressors will affect different crop varieties and livestock breeds now and in future
- Reforms to enable sustainable management and governance of irrigation schemes and to facilitate efficient utilization of water resources
- Transitioning to a pluralistic, demand-driven agricultural extension and advisory system, including digital technologies
- Reducing food trade barriers, especially in times of crisis
- Promoting climate smart agriculture

Climate effects on both crops and livestock are also more pronounced in the lowlands compared to the highlands. Teff is the dominant crop in the lowlands, followed by wheat. Climate change is expected to decrease teff yields by 8 percent under an average dry/hot scenario and by 3 percent under an average wet/warm scenario by the 2050s in the Awash basin, which contains most of the teff production in the lowlands. This compares to decreases of just 2 to 3 percent in the Abay basin, which contains most of the teff production in the highlands. For wheat, climate change is expected to result in between a 3 percent loss and a 3 percent gain in the Awash basin, compared to gains of 1 to 3 percent in the Abay basin. Around 83 percent of teff production and 66 percent of wheat production are currently in basins within the highlands. Additionally, while most livestock production is found in the Ethiopian highlands, production in lowland areas is expected to experience more significant declines. The Afar region, which contains the northeastern lowlands, is expected to see cattle milk production decreases of between 13 and 25 percent in the 2040s under CG, compared to a projected national decrease of between 6 and 11 percent. Cattle meat is similarly worse off in the lowlands, with decreases of between 4 and 14 percent in the Afar region and just 2 to 5 percent nationally. The Afar region produces the most goat meat in the country, and is expected to see yield declines of between 6 and 21 percent, compared to national declines of between 5 and 13 percent.

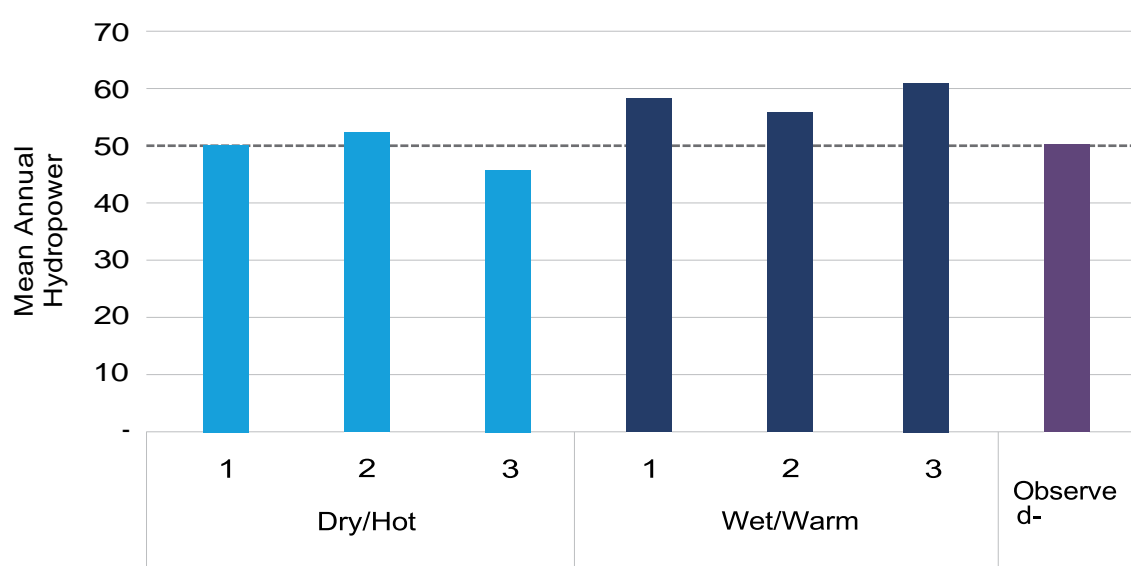
3.3 Making energy, transport, digital, and cities more climate-resilient

Reliable, affordable, sustainable, and resilient energy services are a key enabler for the country's socioeconomic growth and job creation. Such energy services enable an increase in agricultural productivity by allowing mechanization, improved irrigation, and food processing and storage and distribution. They also help realize human capital potential through better education and health services, development of digital skills for the labor force, and better access to information through digital connectivity. Energy services are essential to the development of industry and manufacturing, without which the backup power required would be much more expensive and often require the use of fossil fuels.

Via its National Energy Policy and the Energy Efficiency Strategies for various sectors, the government is aiming to substantially increase energy access. Key 2030 goals for the energy sector from the 10YNDP and the HGERA are:

- Achieving universal electricity access (to increase electricity customers from 5.8 million to 24.3 million and to increase the electricity coverage from the current 53% to 100%)
- Expanding the grid electricity network to facilitate increased access and higher consumption
- Increasing electricity exports to neighboring countries
- Ensuring healthy financial position of the sector
- Encouraging private investment, such as independent power producers (IPPs) and PPPs.

Figure 3.9. Mean annual hydropower generation (TWh)



Source: World Bank modeling results

Ethiopia's electricity mix is already green, and the government has plans for further increasing generation from renewable energy. The Power System Expansion Master plan 2021 provides the projections for different generation technologies for 2045 as follows: hydropower capacity to increase from over 3,000 MW (2021) to almost 22,100 MW (2045), installation of new solar capacity of 5,050 MW (2045), and increase of installed wind capacity from 324 MW (2021) to 6,929 MW (2045). In addition, the Master plan brings out the need to develop nearly 5,000 MW of geothermal energy by 2045 to help avoid the need to develop nearly 4000 MW of natural gas-based generation. This extensive development of geothermal energy can serve as base load and help conserve stored water in hydropower reservoirs for meeting peak demand that would be otherwise met through natural gas-based generation.

Climate change, with increased variability of precipitation, will have impacts on hydropower generation, with an increased variability of generation. As noted, a higher annual volume of water will be available in the reservoirs in most scenarios, allowing the same hydropower assets to generate more energy. However, variability in water availability for electricity generation across seasons as well as across years will increase. In addition, climate-induced variations in temperature and humidity may impose significant variations in electricity demand, while variations in wind speed and solar insolation will make the supply from these variable renewable energy (VRE) sources more pronounced. Modeling for the CDR shows that under climate change, hydropower generation is projected to increase 13–22 percent under

wet/warm futures and may increase or decrease (ranging from -5% to +9%) under dry/ hot futures (Figure 3.9).

There is therefore a need to adapt to climate-induced impacts on hydropower generation Steps are needed to adapt to climate-induced variability in demand and supply. These steps include: (i) diversifying the electricity generation mix to handle climate-induced increased variability in hydropower generation, (ii) maintaining adequate energy and capacity reserve margins to handle climate-induced demand-supply variations, (iii) modernizing load dispatch and system defense to address system vulnerabilities that can cause blackouts, (iv) strengthening reservoir management and water availability forecast systems to ensure optimal use of water across different uses, (v) constructing regional power interconnections to enable the electricity trade to balance demand-supply variations, and (vi) establishing an energy exchange for trade in climate-aligned energy products.

In addition, resilience to climate-induced damage to electricity infrastructure will need to be improved. Climate-induced variations in water availability, floods, temperatures, storms, etc. can damage electricity infrastructure or reduce its operating efficiency. In the case of the design of hydropower and geothermal power plants, it is important to make the design resilient to variations in water availability. In the case of network infrastructure such as transmission and distribution lines and substations, the infrastructure design should be resilient to floods, storms, and cyclones with adequate built-in redundancies.

The transport sector plays a vital role in driving structural transformation and economic growth in Ethiopia, as it serves as the backbone for various industries and facilitates the movement of goods and people across the country. A well-developed transport network not only enables Ethiopia to integrate with global markets and open up export opportunities but also supports key growth sectors such as mining, tourism, and manufacturing. It also plays a pivotal role in human development by improving access to education and health care. Additionally, rural roads enhance agricultural productivity, reduce post-harvest losses due to spoilage, and increase market access.

Given the importance of filling the transport infrastructure deficit to support structural transformation, the GoE has developed strategies, plans, and targets for the sector. The 10-Year Transport Perspective Plan (2020–2030) provides specific development goals and investment plans that aim at expanding transport infrastructure and services; providing efficient logistics services; increasing the participation of private investors; and strengthening the sector's institutional implementation capacity. A few specific targets include: (i) increasing the total road coverage of the country from 144,027 km to 245,942 km, whilst upgrading and strengthening 28,099 km of existing federal and regional roads; (ii) increasing railway tracks from 690 km to 4000 km. The total investment required to implement this plan is estimated at 3.04 trillion birr (over \$56 billion⁶⁹) for the 10-year period.

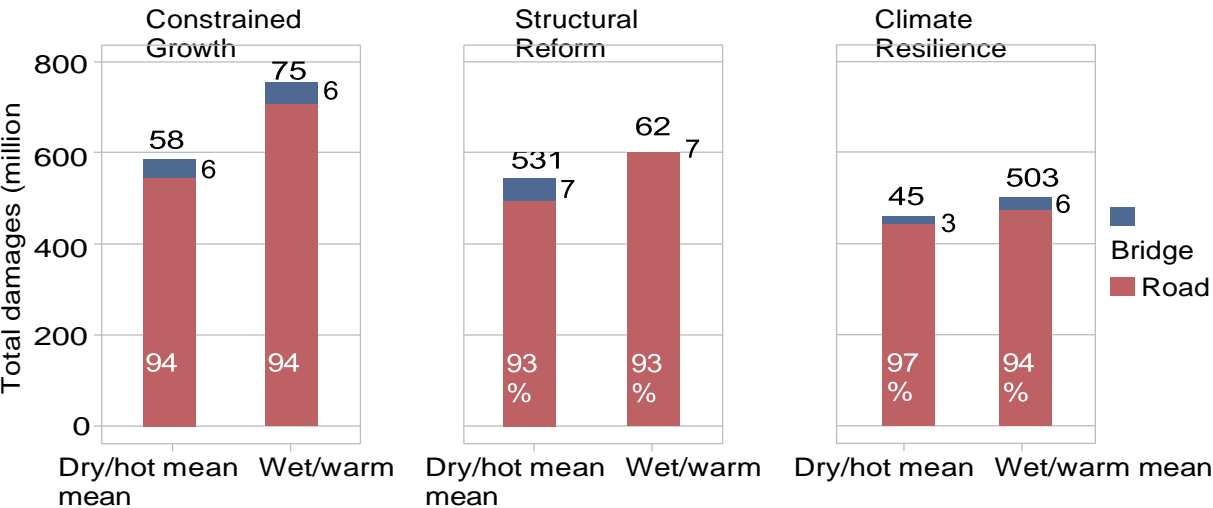
At the same time, the transport sector is vulnerable to climate change, which affects service delivery and will require measures to build climate resilience. Figure 3.10 shows the incremental annual repair and maintenance and adaptation costs for roads and bridges and Figure 3.11 the annual delays from disruptions (in hours) due to climate impacts, both incurred between 2041–2050 relative to the historical baseline (1995–2020). The left bar within each box represents the average under three different dry/hot futures, and the right the same for three wet/warm futures. Climate change causes road and bridge disruptions due to failure, and damage due to increased temperatures, changing precipitation, and recurrence of flooding. The analysis shows that annual costs due to climate effects are the greatest under the CG scenario and the lowest under the RES scenario.⁷⁰ Costs are also higher under the average wet/warm future relative to the average dry/hot future.

69 1US\$=54birr

70 Under the constrained growth scenario, roads and bridges are assumed to be designed to current design standards and managed through reactive maintenance. Under the structural reform scenario, both the road stock and the fraction of paved roads are assumed to increase. In addition, improvements in design standards are implemented, such that all new roads are assumed to be built with proactive climate change adaptation measures included. Under the climate resilience scenario, proactive adaptation measures to climate change are implemented for both new and already-existing roads, with existing roads upgraded whenever they require repair and maintenance. Proactive adaptation measures include denser seals and upgraded bitumen binders on paved roads to cope with higher temperature, wider paved shoulders, upgraded road base strength, increased gravel wearing course thickness, upgrading unpaved roads to paved for higher precipitation, and increasing design return period for culvert size to accommodate the new 50-year flood level.

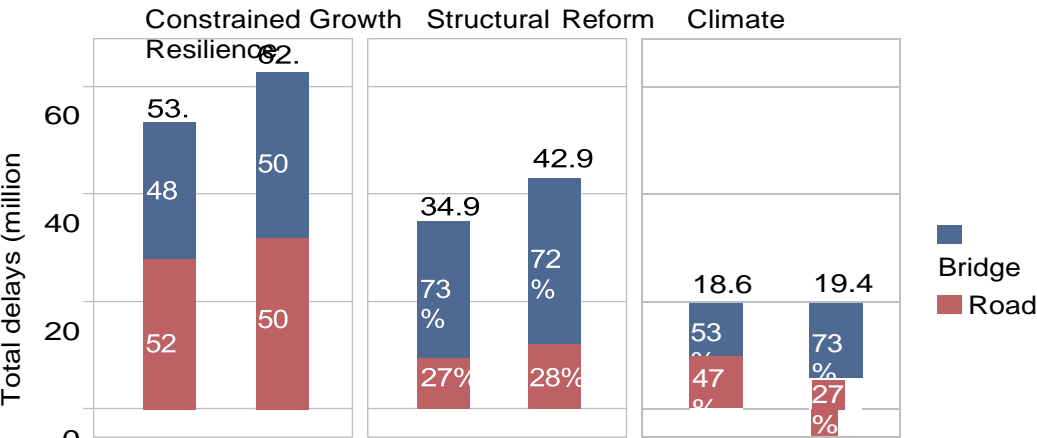
Under the wet/warm future, for example, additional repair costs of US\$755 million and a 0.05 percent loss in labor supply are incurred annually between 2041–2050 due to climate change under the CG scenario, where current design standards are maintained. The repair costs fall to US\$628 million and US\$503 million under the REF and RES scenarios, respectively. Investing US\$9 billion in proactive adaptation measures between 2041–2050 under the RES scenario could avoid up to USD 13 billion in roads and bridges costs as compared to the CG scenario. Similar results hold for annual delays from disruptions with one important exception: a greater fraction of the delays are caused by climate change impacts on bridges than by climate change impacts on roads. Economic losses associated with the delays due to connectivity interruption are typically 2 to 10 times greater than the physical damage.⁷¹ These are however not estimated in the current analysis.

Figure 3.10. Annual roads and bridges costs, 2041–2050



Source: World Bank modeling results

Figure 3.11. Annual delays from disruptions, 2041–2050



Source: World Bank modeling results

71 World Bank Group/GFDRR. 2021. Assessment of Economic Impacts from Disasters along Key Corridors Country Climate and Development Report:

([HERE](#)); World Bank. 2017. Climate Vulnerability Assessment: Making Fiji Climate Resilient. ([HERE](#)); World Bank. 2019. Climate Resilient Road Assets in Albania. ([HERE](#))

While building roads and other transport infrastructure to higher standards will help to build resilience to climate impacts, additional measures will be needed:

- **Strategic maintenance, especially for drainage assets.** The backlog of maintenance activities is exposing Ethiopia's transport infrastructure to climate risks, and strategic maintenance plans need to be sufficiently budgeted and adequately executed.
- **Consideration of networks and services in addition to individual transport assets.** Connectivity is crucial for emergency response and disaster relief. An integrated multimodal transport network is needed to improve the redundancy of the network and ensure the uninterrupted movement of people and goods.
- **Climate resilience mainstreamed into the life-cycle transport asset management process.** While the government has invested in transport asset management systems, considerations for climate resilience need to be incorporated in the asset management process from planning, design, and construction, to maintenance and emergency response and repair.

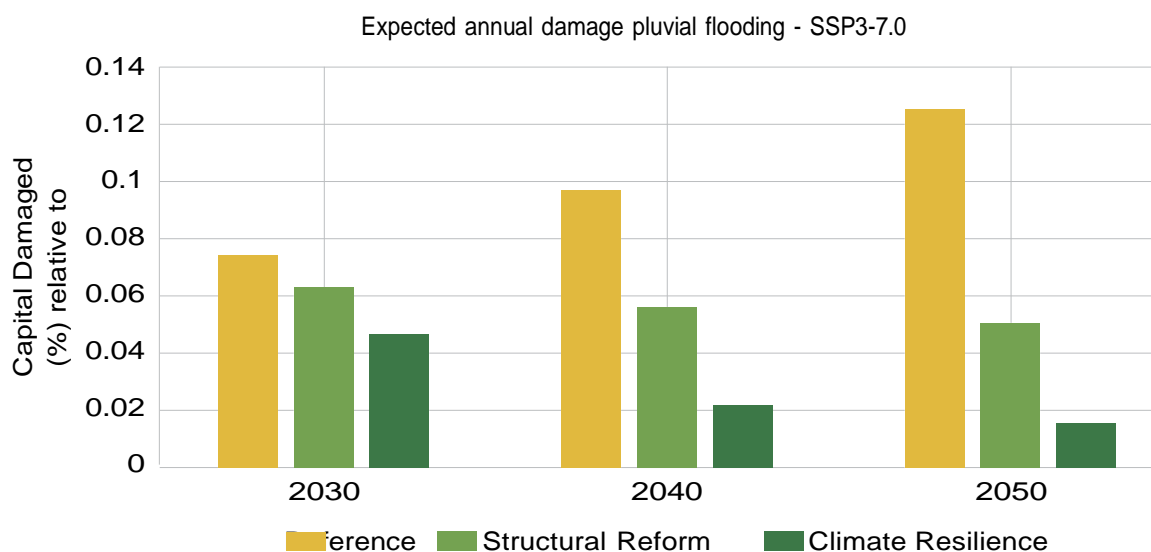
The pace of digitization in Ethiopia has lagged compared to regional peers such as Kenya and Rwanda; however, in recent years, the GoE has introduced national frameworks outlining commitments for ICT. The Digital Ethiopia 2025 Strategy provides a framework on digitization opportunities across sectors. To realize national ICT frameworks, the GoE is enabling existing and new public entities to develop and execute goals. Important reforms include: (i) Consolidation of the digital agenda under a single ministry, where two previously separate ministries were combined in 2018 to form the Ministry of Innovation and Technology (MinT); (ii) Establishment of a telecommunications sector regulator, the Ethiopian Communications Authority, and the subsequent liberalization of the ICT sector; and (iii) Launch of a new, foundational digital ID system, Fayda, to enhance trusted service delivery and increase inclusion, as part of the National Digital Identity Project. Although the digital strategy has only a limited focus on climate, it references two Ethiopia-specific strategies (Annual Green Tech Report, 2019, and Green Tech Directorate, 2012), highlighting the need to boost the GoE's understanding of the ICT and climate nexus. This remains an important area to build climate-resilient digital infrastructure.

Sustainable urban development will be critical to achieving the strategic objectives of the 10-year Perspective Development Plan. Ethiopia is urbanizing rapidly. Between 2000 and 2020 the urban population increased from 9.9 million to 25.4 million. By 2050, this is expected to increase almost fourfold to 83.9 million, increasing the urbanization rate from the current 23 to 39 percent.⁷² Key focus areas of urban development are: to reduce the imbalance between the demand and supply of residential housing; to facilitate green development; to develop small and medium-sized towns and decentralized urban structures for equitable territorial development; and to provide an adequate, sustainable, and equitable supply of land to enable sound urban development.

Urban physical infrastructure is, at the same time, vulnerable to increased precipitation and flooding. Under a pessimistic climate future (SSP3–7.0), capital damages to Addis Ababa (Figures 3.12 and 3.13) may increase two-fold, reaching up to 0.13 percent of the total national capital. Structural reform provides significant resilience, keeping capital damages relatively constant over time. However, proactive adaptation could reduce the additional capital losses by 90 percent and includes measures such as higher design and engineering standards for new infrastructure to offset climate change impacts.

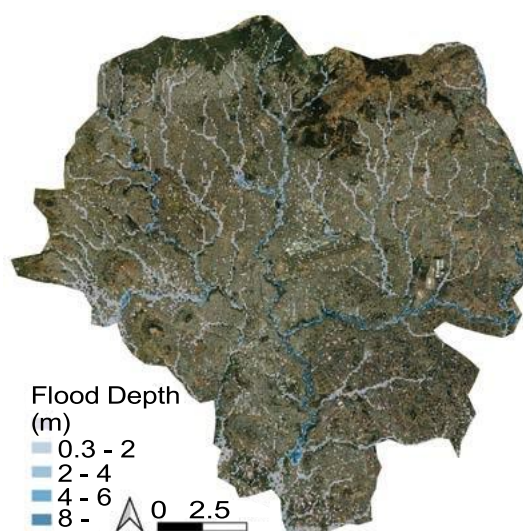
72 World Bank. 2023. Population Estimates and Projections. ([HERE](#))

Figure 3.12. Capital damages to Addis Ababa, SSP3–7.0



Source: World Bank modeling results

Figure 3.13. Historical 20-year floodplain, Addis Ababa



Additional measures to reduce the climate and disaster risks of Ethiopia's urban areas include:

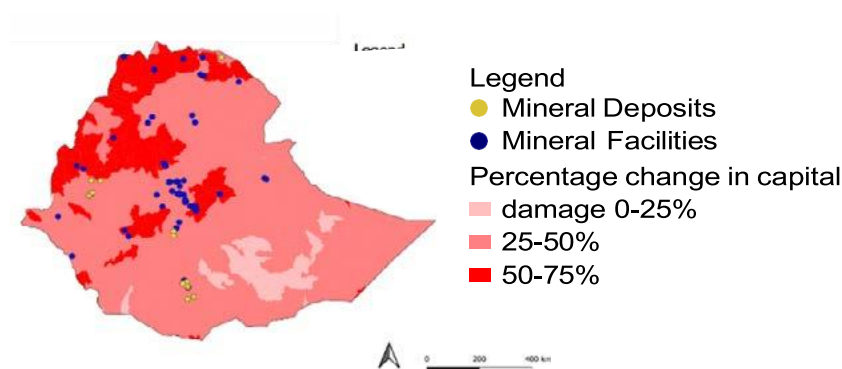
- **Invest in grey and green solutions for disaster risk reduction:** Given the rapid urbanization, a combination of grey (technical) and green (nature-based) solutions is essential to mitigate urban disaster risks such as flooding, landslides, and heat stress. This involves investing in flood protection, water storage, and breezeways for improved airflow.
- **Improve risk-informed land use planning:** Enhancing the understanding of urban climate and disaster risks, identifying hazards, and enforcing development controls can prevent new risks. Climate-sensitive land use planning also avoids carbon lock-in, costly retrofits, and protects environmentally sensitive areas.
- **Enhance land administration systems:** Establishing or improving digital land administration systems encompassing land use planning, rights, regularization and registration, and land revenue mobilization can better leverage urban land resources for resilience-building adaptation and mitigation.

3.4 Diversify the economy by tapping into mining and tourism opportunities

The development of large-scale mining operations is a cornerstone of the government's economic diversification agenda. Ethiopia's mining industry has a rich history, dating back over 1,000 years with artisanal gold mining activities still dominating the sector today.⁷³ The sector's contribution to GDP grew to 3 percent in 2018, up from 0.5 percent in 2008.⁷⁴ Since 2015, the industry has attracted over US\$ 3.5 billion in foreign direct investment.⁷⁵ In 2020, the government approved a 10-year economic plan aimed at boosting the amount of foreign-exchange earned through export and import substitution of minerals from \$265 million currently to \$17 billion by 2030.⁷⁶ The government has prioritised the production of potash, a key mineral in fertilizer production, and if coupled with investments in transportation (rail) infrastructure, this could contribute to exports earnings, and diversification of the export basket.⁷⁷

The mining sector in Ethiopia faces vulnerabilities to climate change impacts. Droughts, floods, and extreme heat can disrupt mining operations, impacting water supply, infrastructure, and worker productivity.⁷⁸ Figure 3.14 shows the overlap between locations of mineral deposits and facilities and areas where infrastructure is likely to be affected by inland flooding under the CG scenario. The overlay shows that infrastructure at existing and future mining facilities is at significant risk of damage from flooding and that this risk increases by as much as 50–75 percent in some locations due to climate change.

Figure 3.14: Mineral deposits/facilities and inland flooding under CG scenario



To mitigate climate change impacts, the government could implement various reforms such as:

- **Resilience Regulation and Planning:** (i) Introduce requirements for climate risks and vulnerability assessments and use in ESIA/ESMP processes; (ii) Ensure that policies, regulations, and processes cover incremental and increasing severity of climate change impacts.
- **Emergency and Disaster Response:** (i) Identify roles and responsibilities (including for mining companies) for collaboration on disaster response (outside of mining areas); (ii) Introduce requirements for Emergency Preparedness and Response Program (EPRP) (for mining related emergencies/disasters initiated by the mining activity).
- **Post-Closure and Land-Use Planning:** (i) Introduce requirements for Mine Closure and Rehabilitation Plans (MCRPs) to consider climate change in designs; (ii) Introduce requirements to consider repurposing and use of abandoned mines to support climate mitigation outcomes.

73 EMIS. 2022. Ethiopia: Mining 2022.

74 Extractive Industries Transparency Initiative (EITI). 2019. Accessed on 26/07/2023. (HERE)

- 75 EMIS. 2022. Ethiopia: Mining 2022.
- 76 EMIS. 2022. Ethiopia: Mining 2022.
- 77 Ethiopian Mineral Potential. Presented by: Ms. Rahel Getachew, CEO, Ethiopian Mineral and Petroleum Corporation.
- 78 McKinsey & Company. 2020. "Climate risk and decarbonization: What every mining CEO needs to know." January 28, 2020. Available at: <https://www.mckinsey.com/capabilities/sustainability/our-insights/climate-risk-and-decarbonization-what-every-mining-ceo-needs-to-know> (accessed on 26/07/2023).

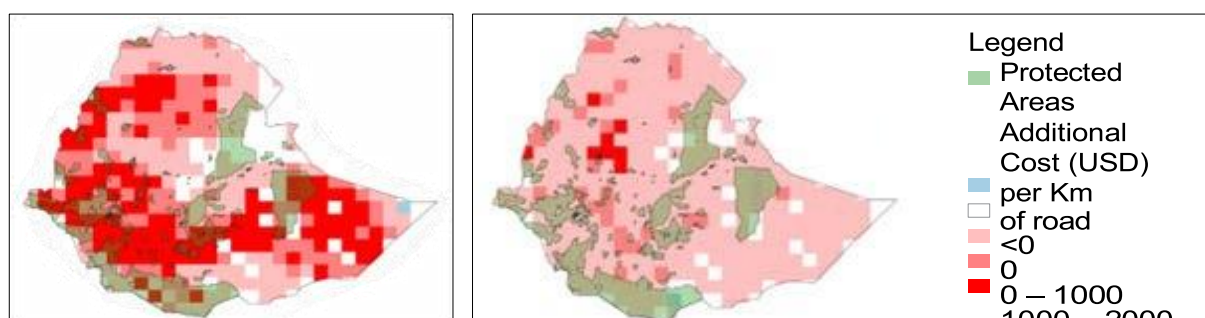
The Government has identified that Ethiopia's tourism sector has significant potential for creating **job opportunities, boosting economic growth and generating foreign exchange**. In 2019, with 812,000⁷⁹ international tourist arrivals, tourism and travel represented 6.3% of the total economy. However, the COVID pandemic and national lockdowns in 2020 led to a 67% decrease in international tourist numbers, though these have rebounded since Ethiopia's NDP and the Sustainable Tourism Master Plan (STMP) 2015–2025 prioritize:

- Developing 59 new tourist destinations, whilst adding value to 40 existing ones;
- Increasing the number of international tourists from 850,000 to 7.3 million;
- Raising domestic tourism numbers from 24 million to 70 million through aggressive promotion;
- Raising job opportunities created through tourism from 1.6 million to 5.2 million.

Additional environmental and conservation-related targets have been established to promote tourism in natural sites, including protected areas and wildlife habitats.

Tourism faces climate-related risks, such as changes in water availability; biodiversity loss; extreme weather events damaging infrastructure, facilities, and services; and altered travel patterns due to changing weather and seasonality. Fuel price increases and societal shifts to tackle climate change can impact tourism demand and operations.⁸⁰ Tourism is also dependent on biodiversity and natural capital (landscapes, flagship species, ecosystems). Tourism is, therefore, considered to be a highly climate-sensitive economic sector similar to agriculture.⁸¹ As shown in figure 3.15, infrastructure near protected areas in the south-west corner of the country is vulnerable to damage from climate change under the CG scenario and without adaptation (left panel), and less so when climate resilience is built into the infrastructure and sustainable land management practices are implemented to manage flood risk are implemented (right panel).

Figure 3.15. Infrastructure vulnerability near protected areas, constrained growth (left), climate resilience (right)



Source: World Bank modeling results

Some measures to prepare for the impact of climate change on tourism include: i) developing nature-based tourism sustainably; ii) upgrading natural and physical assets to be climate-resilient to changes in seasonality, temperatures, impacts on wildlife and plant life, etc; iii) creating a Tourism Climate Change Action Plan aligned with existing development strategies to mitigate climate change effects.

79 Hussen T. 2021. "An Overview of Current Ethiopian Tourism." Journal of Tourism and Hospitality. Vol 10: p382.

80 UNWTO. 2023. Climate Change and Tourism. United Nations World Tourism Organization.

3.5 Protecting and leveraging human capital for climate action

Education is key in the government's strategy to transform the economy. The government has prioritized investments in the sector: more than a fifth of public spending has been directed to education. Nevertheless, improvements to boost quality and accessibility are needed. As of 2015, only 28.9 percent of girls and 30 percent of boys completed lower secondary school in Ethiopia. Both rates are lower than in Sub-Saharan Africa (43 and 46 percent) and the low-income country grouping (38 and 43 percent), respectively.⁸² Furthermore, the combined impact of COVID-19, ongoing conflict, and climate change has contributed to at least 13 million children being out of school in Ethiopia, with long-term consequences for their future.⁸³

Education is important for resilience, and it is also critical that the country effectively adapt to the impacts of climate change on the education system. A better-educated, skilled workforce will also be more capable of adapting to productivity losses in specific sectors and shifting jobs due to the impacts of climate change. At the same time, climate change has a significant impact on the Ethiopian education system, affecting the health, safety, and academic performance of students and teachers. Rainfall variability can reduce agricultural productivity and increase the likelihood of stunting, which is directly associated with lower cognitive development, leading to lower education outcomes. Climate change can lead to reduced access to water, which can affect the health and hygiene of the students and teachers and can disrupt the learning system—particularly for girls, who bear the burden of fetching water for households. Flooding damages school infrastructure and induces permanent community displacement, leading to temporary and or permanent school closures. Heat waves affect working memory and cognitive development, impeding students' ability to learn and a teacher's ability to teach.

Going beyond planned strategies and programs, the government will need to implement adaptation measures in the education sector to build resilience. Measures include: (i) Enhancing system-level capacity and developing disaster risk management strategies to make education services more resilient to climate shocks. Building schools and other education facilities to higher design standards to cope with the impacts of climate change will also be important; (ii) educating communities about the impacts of changing rainfall patterns and how to cope with them can help build resilience and reduce vulnerability to the impacts of climate change.

Ethiopia has similarly made progress on achieving health outcomes. Ethiopia's health sector has made remarkable progress over the last two decades. Life expectancy at birth has increased from 58 years in 2007 to 65.5 years in 2017. Between 2000 to 2017, maternal mortality decreased from 871 deaths/100,000 live births to 401/100,000; the under-5 mortality rate from 166/1000 to 59/1,000 live births; and neonatal mortality from 49/1000 to 33/1000 live births.⁸⁴ In the past five years, mortality and morbidity associated with malaria has declined dramatically. Between 2015 and 2019, the number of malaria-related deaths dropped from 3.6 to 0.3 per 100,000 population at risk, and malaria case incidence dropped from 5.2 million in 2015 to less than 1 million in 2019. The updated Health Sector Transformation Plan II for 2020 to 2050 provides the strategic vision of the government to accelerate progress towards Universal Health Coverage (UHC), protect people from emergencies, create woreda transformation, and make the health system responsive to people's needs and expectations. The overall costing for HSTP-II implementation is \$21.88 billion and \$27.55 billion at base and high-case scenario respectively.

Climate change impacts on health and labor productivity are surprisingly limited due to underlying climatic conditions and if health sector development strategies

are implemented as planned. Figure

3.16 shows the predicted impact of climate change-induced heat stress impacts on labor productivity.

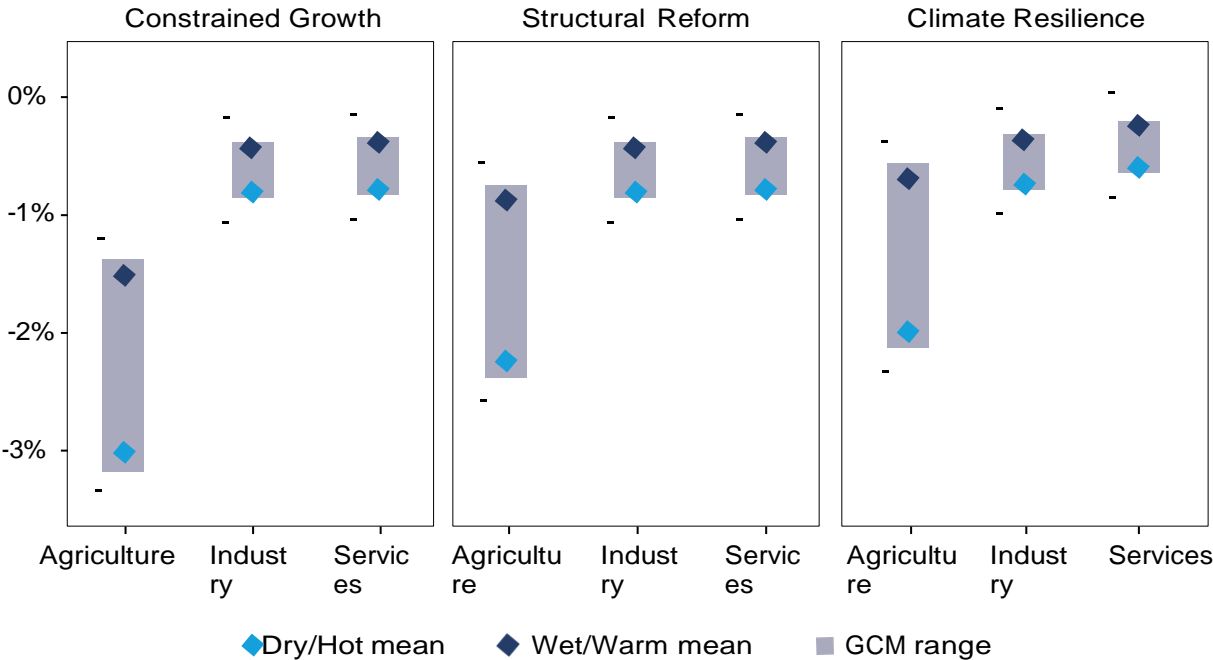
82 World Bank. 2023. Ethiopia data. <https://genderdata.worldbank.org/countries/ethiopia>.

83 UNICEF Ethiopia. 2023. "Learning and Development." ([HERE](#))

84 FDRE, Ministry of Health. <https://www.moh.gov.et/site/fact-sheets>.

Compared to other countries in Africa, heat stress impacts are limited due to moderate temperatures in populated parts of Ethiopia: only 2 months with temperatures in excess of 30°C in Oromia and none in Addis Ababa. The agriculture sector is the most vulnerable due to a higher proportion of people operating in the lowlands and with outdoor exposure. While malaria and dengue transmissibility could increase by 2050 due to higher temperatures and precipitation, implementation of health sector plans provides significant protection against climate change. Mortality and morbidity from dengue increases by as much as 50 percent under the CG scenario with climate change but falls to 14 percent under the REF scenario despite the impacts of climate change. Similarly, planned WASH developments could offset climate shocks on water-borne and other WASH-related diseases, which represent about 10 percent of total non-injury mortality and 21 percent of morbidity, by 2030 and result in a labor supply gain by 2050 due to reduced deaths and cases of illness.

Figure 3.16. Labor productivity shock, 2041–2050



Source: World Bank modeling results

The government is also taking steps to address the impact of climate change on public health.

It has developed the National Health Adaptation Plan to Climate Change 2018–2020 with four strategic objectives: (i) build the capacity of the health system for realization of a climate-resilient health system;

(ii) enhance the resilience of the health system with regard to the provision of universal health coverage;

(iii) enhance early warning and surveillance in the context of health emergency risk management; and (iv) create an enabling environment for health adaptation to climate change implementation. The Ministry of Health is currently in the process of finalizing the draft of the National Health Adaptation Plan to Climate Change for the years 2022—2025. In addition, the government needs to double down on multisectoral engagements to address some of the critical socioeconomic determinants of health, including agriculture; to improve WASH services; to upgrade the country’s health care infrastructure to support more systemic climate change resilience; to create sufficient knowledge among health care system personnel about the relationship between climate change, seasonal variability and health impacts; and to develop and implement health education campaigns that raise awareness about climate change’s health impacts and encourage adaptive behavior among the general population. These measures will be crucial both to prevent and

respond to climate change-induced health emergencies.

3.6 Low-carbon development opportunities

Achieving Ethiopia's NDC/LT-LEDS emission reduction targets will require transitions in many sectors, with a focus though on LULF and livestock. Forests and other non-built-up lands will need to shift from being net GHG emitters to becoming major carbon sinks, absorbing 100 Mt more GHG than they would have released in 2030 under BAU (as per the targets in the NDC). Significant reductions in the agricultural sector-based emissions are also required, particularly in the livestock sector. GHG emissions from energy, which are currently modest, will need to be more than halved from today's levels despite the rapidly growing energy needs from transportation, urban development, and industrialization. And while GHG emissions from industry (without energy emissions) are allowed to rise in absolute terms, the conditional target requires keeping the GHG intensity of industrial GDP low.

The LT-LEDS has outlined the following most important actions in the LULF and agriculture sectors

for reaching net zero while delivering numerous additional socioeconomic benefits:

- The creation of a carbon sink in the land use sector, particularly through reforestation, afforestation, forest restoration, and reduced deforestation.
- The reduction of livestock-related emissions using a range of interventions, such as increased productivity of livestock (see Box 4).
- Agriculture-related interventions—such as enhancing sustainable agriculture practices and reducing pre-harvest losses.

Box 4: Productivity improvements lead to reduce emissions in livestock sector

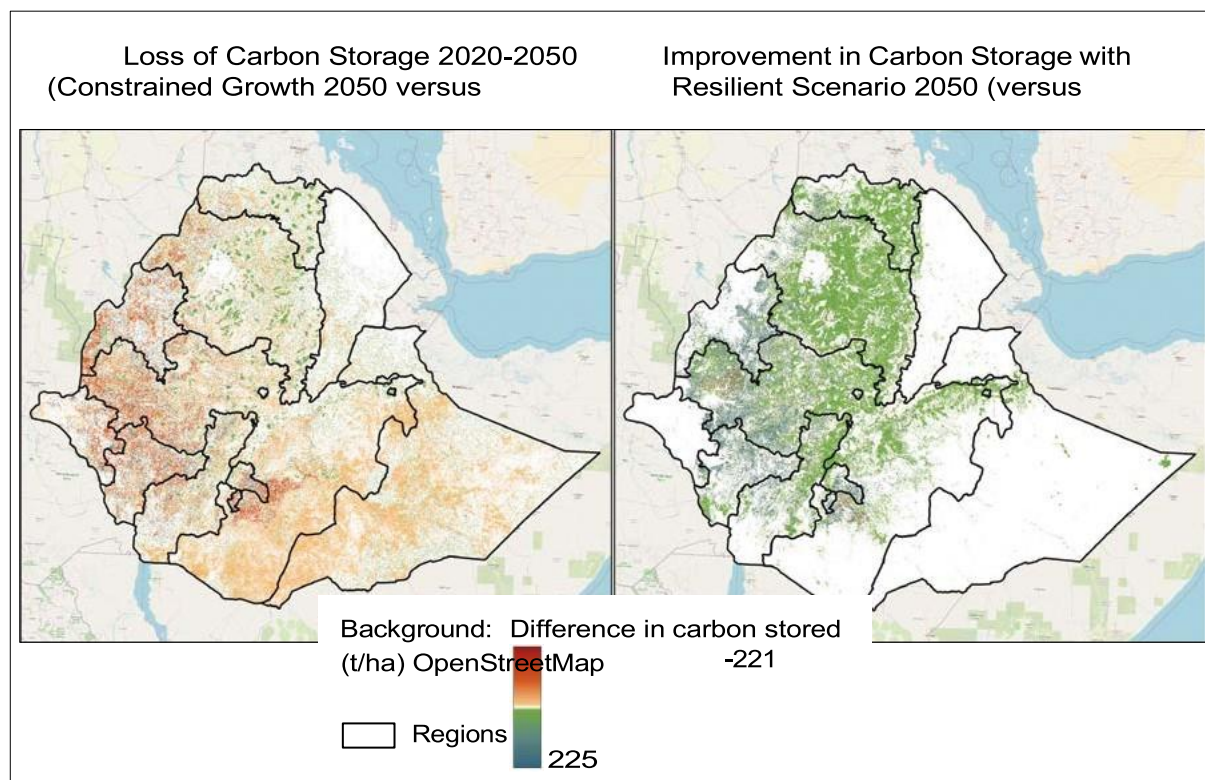
Modeling results show that productivity improvements in the livestock sector result in decreasing GHG emission intensity factors, which result in lower emissions than the 2030 NDC target (180 Mt CO₂eq) for all policy scenarios (See Table B4.1). Increased yields with reduced headcounts result in emissions under the structural reform scenario being 10 percent lower than those under the constrained growth scenario. Additional productivity measures (e.g., oilseed feeding, manure management) can further reduce emissions by up to 40 percent.

Table B4.1. Total Livestock Emissions (MtCO₂e)

Scenario	2030	2040	2050
Constrained Growth	159	166	174
Structural Reform	152	154	155
Climate Resilience	152	154	155
Climate Resilience + Mitigation	130	112	93

Analysis shows that government efforts to reduce emissions from LULF should target the south-west and south-central areas of the country. Modeling results show the spatial variation in the amount of carbon stored in the different biomes in Ethiopia, and the regions at risk for increasing emissions from the LULF sector. The highest carbon storage and sequestration rates are seen in the forested regions in the southwest of the country (covering parts of Gambella, SNNP, and Oromia regions) and in the south-central area between SNNP and Oromia regions. These areas are also those predicted to have some of the highest LULF emissions rates in the CG scenario (Figure 3.17).

Figure 3.17. Comparison of potential carbon losses and gains by 2050



Source: World Bank modeling results

While land restoration and management programs will yield carbon credits, such investments are economical only if they also generate development and resilience benefits.

Total land-based carbon storage including both forested and non-forested lands currently totals 5.4 billion tons of CO₂e; this stock is projected to decline by 171 MtCO₂e by 2030 but then to recover somewhat by 2050 and even to increase by 58 MtCO₂e under the CG scenario, reflecting ongoing government investment in afforestation and restoration programs. Increased investments under the REF scenario have the potential to increase the market value of avoided emissions to US\$99 million per year, and ecosystem-services targeted investments in the RES scenario further increase the carbon value from these investments to US\$130 million per year.⁸⁵ The implementation cost for both of these scenarios is estimated at \$21.2 billion⁸⁶ over 10 years, based on an average cost for SLM of \$1,000 per hectare as reported in the World Bank's Climate Action through Landscape Management (CALM) Program for Results Project for Ethiopia. It will therefore be important to ensure that land restoration programs are anchored to promote development outcomes such as agricultural productivity improvements and flood mitigation gains and generate emission reductions as a co-benefit so that the benefits of these programs outweigh the costs.

The LT-LEDs also highlights important actions for reaching the net-zero target for the remaining sectors, such as:

- The electrification of end-use sectors—such as transport, residential, commercial, and industry—and replacing fossil fuels combined with expanding renewable power production.

⁸⁵ For these estimates, the mean price of \$10 per ton CO₂ for standardized carbon credit contracts was taken from the World Bank's State and Trends of Carbon Pricing 2022 report.

86 \$21.2 billion is the cost for the 2050 ambition. The cost for 2030 ambition is only \$10.8 billion over 10 years.

- Waste sector interventions—such as reducing waste per capita, waste at source, and wastewater emissions as well as significantly increasing the waste collection and recycling rates.
 - Industry-related interventions, such as improving the efficiency of product use and utilizing advanced technologies like carbon capture and storage (CCS).

Ethiopia's mining sector also offers untapped resources needed for the renewable energy transition. Ethiopia is the sixth-largest producer of tantalum (a technology-critical element used in electronic equipment) globally. And undeveloped tantalum and lithium deposit are said to have total metal content estimated at \$32 billion. Mineral processing is very energy-intensive and Ethiopia's surplus of green energy, together with its excellent geographic location close to the Suez Canal, could be leveraged to import mineral products from other African nations and process energy transition minerals destined for European or Asian markets.⁸⁷ However, addressing challenges of infrastructure, tough regulations, regional competition, and water stress is essential.

There are significant opportunities to develop low-carbon transport while supporting economic growth and job creation. Although the transport sector currently accounts for less than 5 percent of the country's GHG emissions, this figure is growing rapidly and is expected to reach 10 percent by 2030. As Ethiopia continues to build extensive transport infrastructure and network, enhancing multi-modal integration and transport services can increase transport efficiency while achieving the modal shift to lower-emission modes such as to railway and mass transit. To realize the government's ambitious e-mobility plan, GoE would need to ensure the availability of charging infrastructure through policy incentives, private sector participation, and pilot demonstrations.

In addition, mainstreaming climate education for widespread mindset and behavior change on climate can provide additional mitigation benefits. Introduction of climate change aspects and contents in the curricula and making schools a place where green mindsets are created could support mitigating the impact of climate change on the Ethiopian education system. Education empowers people with the knowledge and skill to negotiate and adapt to climate change; encourages them to change their attitudes and behavior towards the environment; and helps them to make informed decisions in sustaining and regenerating ecosystems. Education systems can also help create platforms where employers, universities, and youth can connect; provide demand-side interventions like targeted informational campaigns and vouchers for marginalized youth; and support climate R&D in universities.

87 Ethiopian Mineral Potential. Presented by: Ms. Rahel Getachew, CEO, Ethiopian Mineral and Petroleum Corporation.



4 MACROECONOMIC AND POVERTY IMPLICATIONS OF CLIMATE CHANGE



Macroeconomic and Poverty Implications of Climate Change

4.1 Climate change and Ethiopia's future growth

Climate impacts will occur against a backdrop of acute resource shortages and very high, near-term policy uncertainty. The past two decades of state-led growth, which was underpinned by overvalued exchange rates alongside other deep policy distortions, have exhausted fiscal space and depleted buffers. The related precipitous drop in tax revenues, to just below 7 percent of GDP, has required significant spending consolidation to control deficits, with significant implications for state capacity and service delivery, especially at the local level where frontline climate adaptation action will occur. External financing needs remain large, and the need for a debt treatment under the G20 Common Framework urgent.⁸⁸ The policy environment, meanwhile, is complicated by the ongoing low-level conflict across the country, significant social heterogeneity, and ethnic federalist structure.

4.1.1 Macroeconomic and poverty impacts of climate change

For climate simulations, two baseline scenarios capture near-term uncertainty, and are juxtaposed against two climate action scenarios (Box 5).

The CG baseline represents a policy pathway of greater maladaptation. Although some sectors, notably agriculture, will likely benefit from climate change as crop production increases, climate impacts will materialize through several channels (inland flooding, crop and livestock yields, hydropower production, infrastructure damage, and health and labor productivity). In aggregate, these generate economic losses that are larger in the CG baseline as distortionary, BAU policies reduce GDP and household consumption by more than in the REF baseline which is characterized by greater macroeconomic flexibility, buffers, and adaptive capacity (Figure 4.1A).

Impacts increase over time and are largest under dry and hot climate scenarios. Average annual deviations from the GDP and household consumption CG baselines range between 1–1.5 percent (Figure 4.1A) and are larger in the dry and hot climate scenario. Moreover, the magnitude of impact rapidly increases from 2030 onwards, with average deviations from GDP and household consumption reaching as high as 5 percent during the 2040s. The corresponding cumulative economic loss rises from about 10–14 percent (of 2022 GDP) between 2023–30, to about 20–30 percent of average decadal GDP between 2030–40 and even more thereafter. Losses are likely underestimated given indirect impact channels not captured in simulations as well as the magnifying effects of climate-induced increases in conflicts, and migration shifts, all of which are relevant for Ethiopia. By relative contribution, the largest losses stem from heat stress on labor productivity and climate impacts on livestock yields, followed by flooding (Figure 4.1B).

Severe climate shocks will amplify financing and macroeconomic pressures. Flood risk curves are used to simulate the potential damages to capital/infrastructure due to extreme flooding that could occur once in 5 to 100 years. These show significant impacts on GDP (Figure 4.2), with a flood event with a return period of 25 years resulting in a 3.3 percent deviation in CG GDP baselines, rising to 5.3 percent and 7 percent for floods with 50- and 100-year return period respectively. These extreme shocks are persistent (Figure 4.2), lowering potential growth and reflecting lower resilience across the economy (e.g., because of fewer fiscal resources to support a recovery).

88 Ethiopia faces a growing debt burden from debt service payments in the near term. These are projected to be more than US\$11 billion over the next 5 years—an average of \$2.3 billion a year, with three-quarters due to bilateral and private creditors. Debt amortization will increase as a share of overall debt service, rising from \$1.4bn in FY23 to \$1.7bn in FY24, and peak at \$2.9bn in FY25.

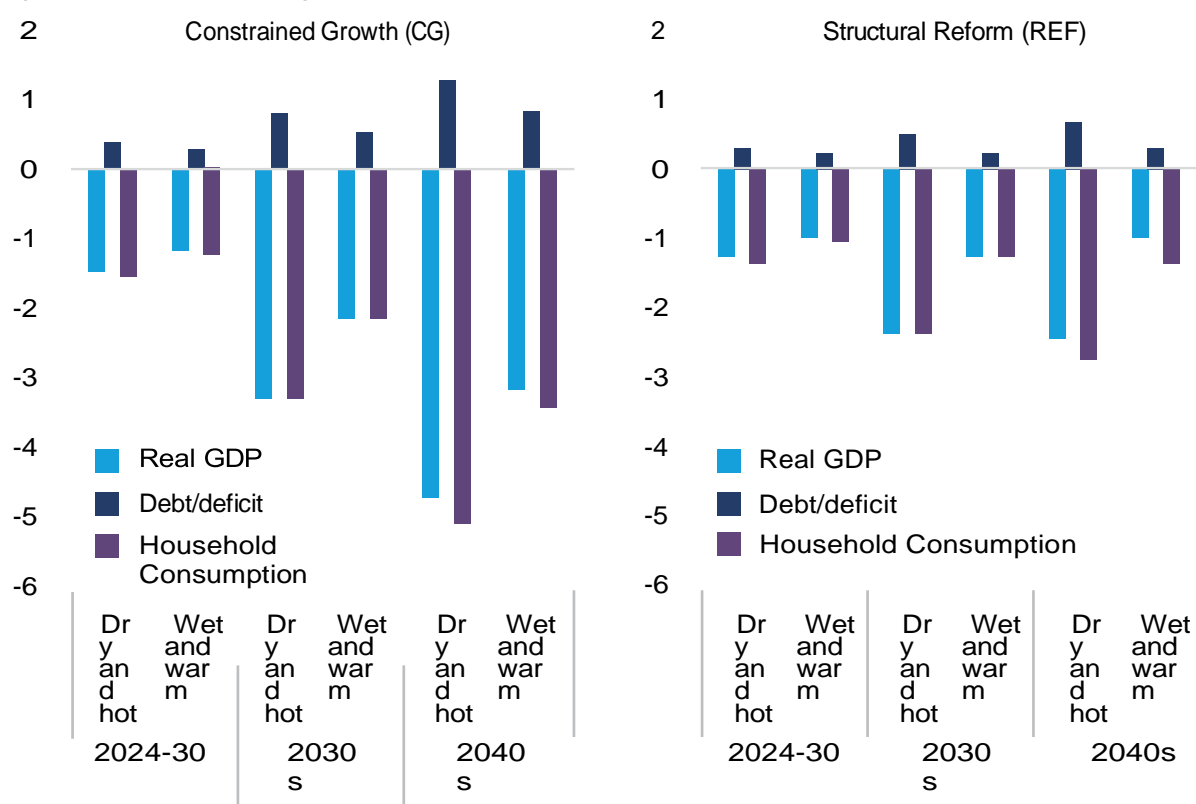
Box 5: Baseline Policy and Climate Action Scenarios

There are two baselines in the MANAGE Computable General Equilibrium (CGE) model. Under the Constrained Growth (CG) baseline, structural reforms are delayed indefinitely; the state's imprint on the economy remains large; and the tax effort remains small as continued structural, exchange rate, and other policy distortions hold back the private sector and external competitiveness. External imbalances narrow over the medium term due to demand compression borne mainly by households and firms, and as completed hydropower projects support rising hydropower exports. GDP sector shares remain broadly unchanged and growth slows to about 4 percent by 2050, reflecting negative or weak productivity growth and an eventual slowdown in population growth.

In the Reform baseline (REF), macroeconomic, exchange rate and structural distortions are dismantled to speed up the economy's structural transformation; trade expands, productivity increases, and the share of private investment rises (relative to public investment). The fiscal envelope expands as a growing tax base and policy reforms lift tax-to-GDP ratios to over 20 percent by the end of the projection period, while the export-to-GDP ratio also doubles. Rising capital imports support capital deepening in the private sector. The average growth rate accelerates to about 8 percent in 2030, before easing to about 5 percent over the medium term in 2040.

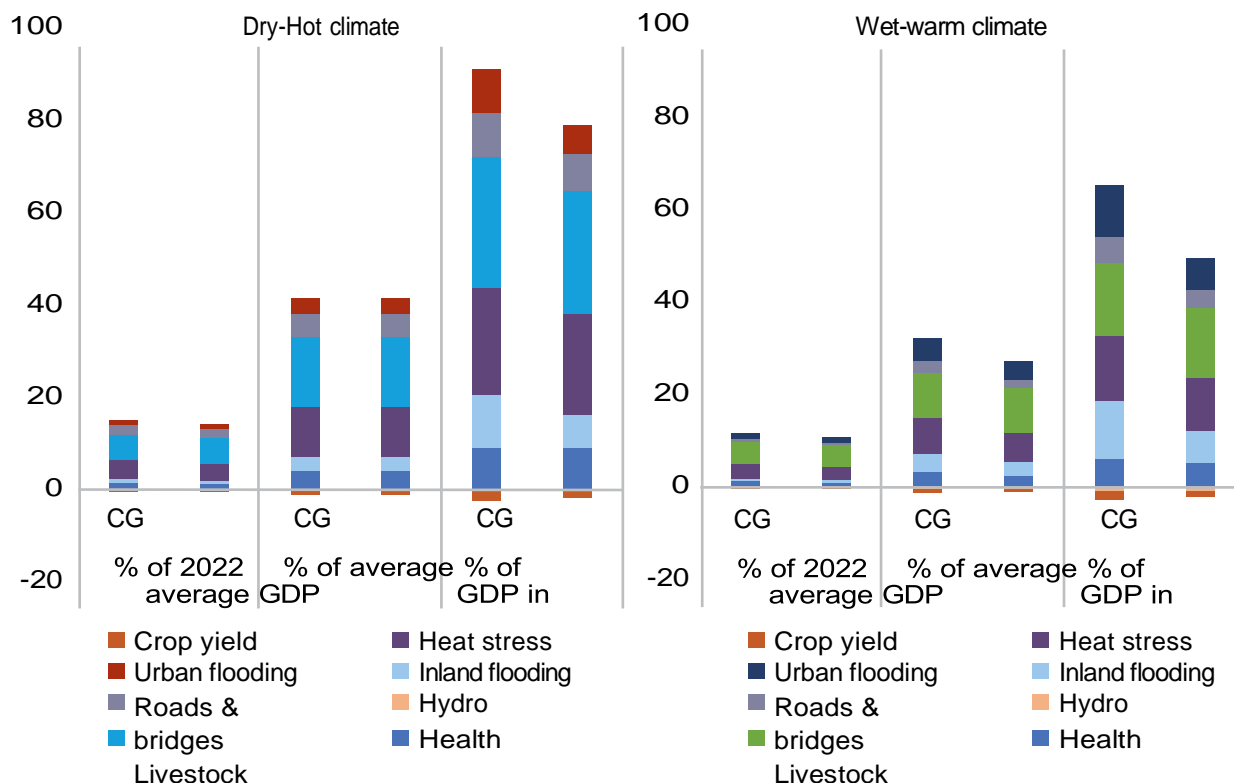
The two climate action scenarios draw on insights from Chapter 3 and NDC and LT-LEDS commitments: (a) Resilient (RES), which layers adaptation actions on top of REF, and b) Green Economy (CRG), which includes selected mitigation actions to support a net-zero or low-carbon development pathway, in addition to adaptation and structural reform

Figure 4.1A. Annual average deviations from CG and REF baselines



Source: World Bank MANAGE simulations. Note: The chart shows the combined average annual impacts from various channels (hydro, crop yields, livestock yield, flooding, infrastructure, health and labor productivity) on real GDP, debt/deficit (percent of GDP) and household consumption relative to CG and REF baselines. Hot and Wet (SSP 2–4.5) scenarios only contain flooding, while Hot and Dry SSP (3–7.0) only include drought.

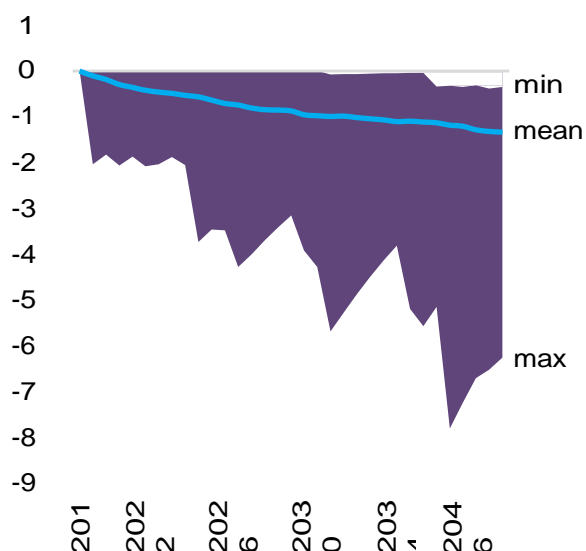
Figure 4.1B. Economic losses by impact channel



Source: World Bank MANAGE simulations. Note: The chart shows the loss from 6 different channels of climate impact relative to CG and REF baselines. The losses are cumulated by decade over the periods 2023-30, 2031-40, and 2041-50 and shown as percent of GDP in 2022, average GDP during the 2030s, and average GDP during the 2040s respectively. A discount rate of 6 percent was used to discount future losses.

Aggregate impacts mask potentially large localized economic and welfare losses in some sectors and regions. Modeling results from Chapter 3 suggest that some crop-producing areas in the highlands, the water sector, and hydropower production could benefit because of increased river discharge under the warmer and wetter scenarios. On the other hand, economic losses under the hotter and drier scenarios reflect impacts of weather shocks on livestock yields, reduced hydropower generation, and human capital impacts (heat stress and diseases). From a spatial/distributional perspective, impacts are larger for pastoralist and agro-pastoralist lowland regions.

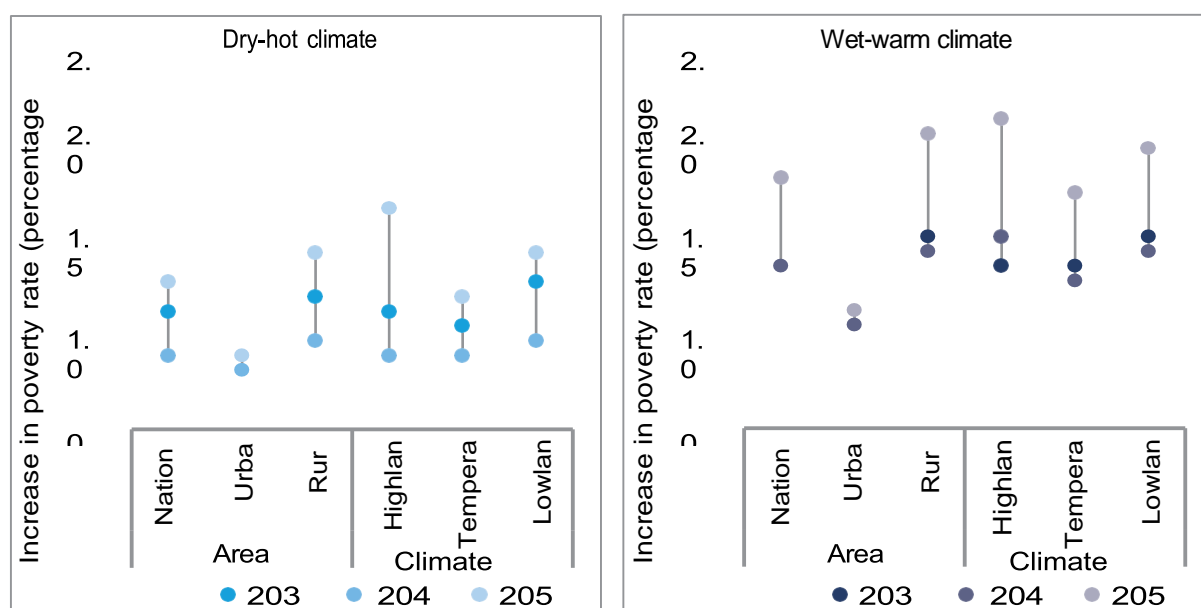
Figure 4.2. GDP loss due to extreme flooding: % deviation from real GDP in CG baseline under SSP3-7.0



Source: World Bank simulations. Flood risk curves are used to simulate the potential damages to capital/infrastructure due to extreme flooding that could

occur once in 5 to 100 years. Loss curves for the 2010–39 era are used.

Figure 4.3 Impact of climate change on poverty rate, relative to CG baseline, by area and climate zones

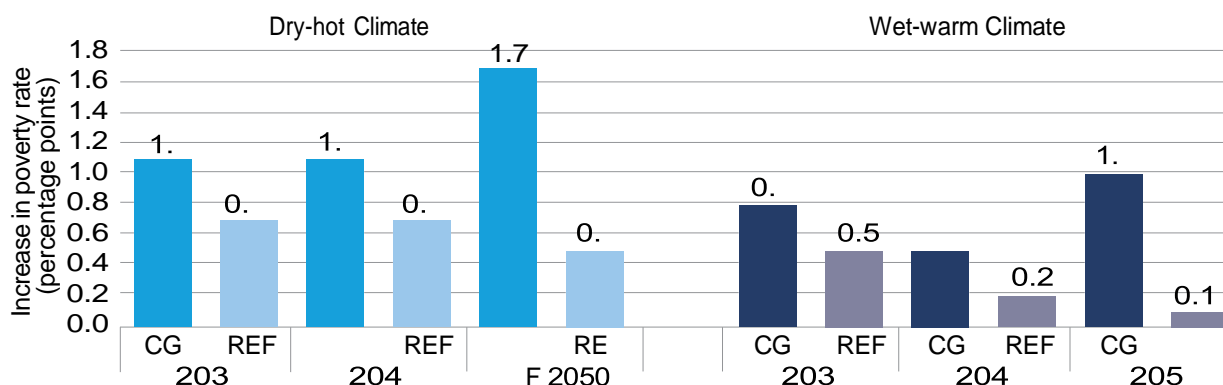


Source: World Bank simulations using World Bank Macro-Fiscal Model (MFMOD) inputs and HCES 2016. The chart shows the increase in poverty rates (\$2.15 in 2017 PPP) due to Dry-hot and Wet-warm climate change scenarios, with respect to the CG baseline scenario (no climate change, no adaptation).

4.1.2 Poverty and distributional impacts of climate change

Climate change will lead to increases in monetary poverty under all the different scenarios modelled in heterogeneous years, though these increases will not exceed 2 percentage points. The results from a microsimulation exercise using different growth and climate scenarios show that in all cases, poverty will increase through 2050. The largest climate change effects will be felt in the dry-hot CG scenario (Figure 4.4), in line with the expected high negative impacts of climate change on GDP. Poverty under this scenario will increase by about 1.7 percentage points by 2050, equivalent to an additional 3.7 million people living below the poverty line due to the climate change impacts. In contrast, in the wet-warm REF baseline scenario, by 2050 poverty would increase only by 0.1 percentage points, and the increase will be lower than in 2030 and 2040. Impacts are heterogeneous across areas and climatic zones.⁸⁹ Overall, the increase in poverty is expected to be largest in highland climatic zones followed by lowland climatic zone under both the wet-warm and dry-hot climate scenarios (Figure 4.3).

Figure 4.4. Impact of climate change scenarios on poverty rate, relative to CG and REF baselines (no climate change)



Source: World Bank simulations using MFMOD inputs and HCES 2016. The chart shows the increase in poverty rates (\$2.15 in 2017 PPP) due to Dry-hot and Wet-warm climate change scenarios, with respect to the CG and REF baseline scenarios (no climate change, no adaptation).

- 89 Ethiopia has three climate zones: Highland (*dega*) consists of highlands with altitudes of over 2,300m, temperate (*woina-dega*), made up of areas with altitudes between 1,500 and 2,300m, and lowland (*kolla*) representing areas lying below 1,500m.

Increases in poverty rates are, in all cases, expected to be smaller under the structural reforms (REF) versus the CG. Microsimulations show lower poverty impacts of climate change under the REF scenario that decline over time, signaling that structural reforms could largely counter the impacts of climate change in the mid-term (Figure 4.4). Although REF does not include climate actions, it includes reforms that will accelerate growth and improve productivity, which will translate into more income-generation opportunities for households, either through salaried work, self-employment, or agricultural production, that help to counter the increases in poverty expected due to climate change under the CG baseline. Poverty rates are expected to decline further with climate actions that involve adaptation actions to cope with the impacts of climate change and strengthen resilience to climate shocks and mitigation measures, over and above implementing structural reforms.

4.2 Fiscal considerations in managing climate change impacts

Ethiopia can benefit from climate change if structural reforms, that can also help to finance needed investments, are undertaken. As discussed in Chapter 3, Ethiopia could potentially become a net food exporter if structural reforms are undertaken; moreover, these benefits increase under climate change. Structural reforms turn climate change into an opportunity for the agriculture sector. Figure 4.1A shows that climate impacts with structural reform are, over the medium to long term, about half the impacts observed under the CG scenario. This illustrates, for example, that benefits from broader improvements in macro-stability and forex availability reduce risk premiums and domestic frictions. They also lower investment hurdle rates needed to undertake and finance (from public and private sources) infrastructure investments in transport, energy, and water storage that in turn can support greater productivity in the economy, higher exports, and better macro-resilience to all shocks, including climate shocks.

The volume of climate resources mobilized in recent years is small, and appears to be declining. Depending on methodology and source, Ethiopia has been able to mobilize between US\$0.67–3.2bn per year, drawn mostly from government revenues and official development assistance (ODA) with a limited share of private financing; external volumes also appear to have fallen since 2020.⁹⁰ Per government estimates, the LT-LEDs projects NDC-aligned needs at US\$5bn per year between 2020 and 2050⁹¹ (with 20 percent financed using domestic/unconditional resources). The corresponding financing gap of US\$4bn per year could rise substantially if shocks reduce the share that the government allocates for climate-related projects.

Given the constrained resource envelope, Ethiopia will need to rely on a mix of financing. Bottom-up sectoral climate investment needs estimated in Chapter 3 for the Green Economy (CRG) scenario—i.e., to support adaptation and mitigation over and above baseline investments—cost about US\$27.6 billion (NPV, cumulative terms) until 2050 in agriculture, livestock, sustainable land management, urban infrastructure, roads and bridges and water storage (Table 4.1).⁹² Over the projection period, cumulative costs amount to 2.5 percent of REF GDP between 2024 and 2030, rising to about 6 percent during 2040-50. Four alternative financing options are considered: debt financing, deficit-neutral domestic tax revenue mobilization or spending adjustments (shifting government consumption towards productive investments), and FDI and ODA. Deficit financing leads to unsustainable debt and crowds out private

90 Climate Policy Initiative. 2022. Landscape of Climate Finance in Africa. ([HERE](#)). The CPI study indicates that as much as \$1.7bn in annual flows in 2019 and 2020 was mobilized with 30 percent financed from government sources, 62 percent from international multilateral and bilateral sources, and 8 percent from private financiers, and with a slightly larger share

allocated toward mitigation. A 2020 CRGE implementation progress study reviewing some 244 initiatives between 2011 and 2019 found that on average US\$0.67 billion per year had been invested over this period, predominantly financed by domestic public funds and used for mitigation projects. The NAP Resource Mobilization strategy identified US\$6bn as the funding need to implement adaptation options identified in NAP. Per the 2023 LT-LEDS, Ethiopia's 2020 submission to the Standing Committee on Finance of the UNFCCC identified US\$22bn in funds mobilized by the GoE during 2011–2019 (or US\$3.2 billion per year) for climate projects.

91 Figures are in net present value (NPV) terms. Total investment requirements under the NDC-aligned scenario for both adaptation and mitigation investments are estimated at \$154bn for 2020–2050, of which US\$31bn are unconditional and the remaining conditional.

92 These investments are not exhaustive and only take into account those damage channels considered in the CCDR.

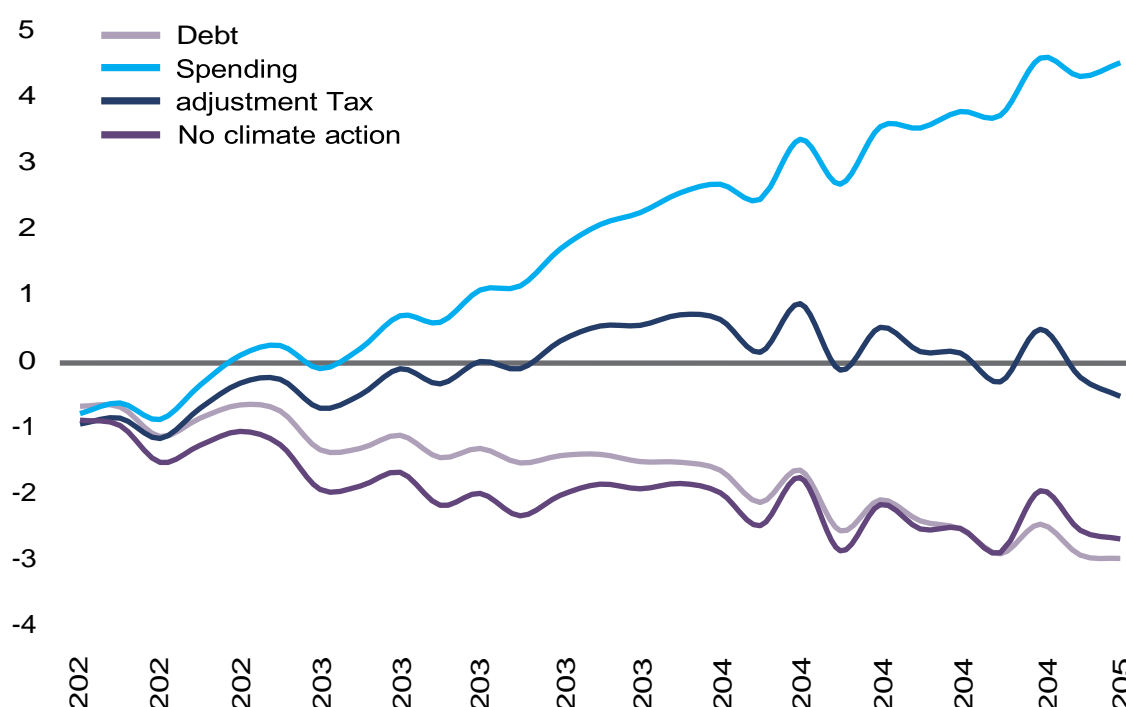
capital. The macroeconomic cost would surpass the benefit of climate action in this case. Shifting government current spending to more productive investment would result in a GDP level higher than in the REF. Tax financing would significantly reduce damages but erode household consumption (and thus the impacts on GDP increases are relatively modest) while higher FDI/ODA ease external financing and fiscal constraints but could lead to an appreciation of the local currency. A mix of all sources generates better outcomes viz. macro sustainability and household welfare—indeed, combining public and private capital (through blended finance) will play an important role in reducing investment risk and attracting greater funding as discussed below.

Table 4.1. Additional investment needs to support adaptation and mitigation (CRG) relative to REF (US\$, NPV with 3% discount rate)

	2024-30	2031-40	2041-50
Agriculture crops*	2,048	7,191	13,560
Livestock	237	1,035	1,135
Water storage	158	706	664
Sustainable land manager	1,547	589	288
Hydropower*	5,906	12,139	15,820
Urban flooding	19	348	1,058
Roads and bridges	1,846	2,579	3,136
Total	4,912	9,142	13,603
Memo: Clean cooking	1,060	1,890	1,585

Sources and Notes: World Bank, *Industrial Economics*. REF projects a dismantling of major macroeconomic, exchange rate and structural distortions in the economy. *Half of agriculture investments and all hydro investments are included in REF as part of planned sector reforms. Every other category shows the additional CRG investments on top of planned REF investments. Clean cooking costs are difficult to ascertain and given their magnitude represent major fiscal trade-offs and not included in overall investment costs or macro-simulations. For some investments, it is hard to distinguish the extra adaptation cost from the baseline investment cost (e.g., for a new bridge, that is also a stronger bridge able to withstand climate impacts).

Figure 4.5. Impacts by financing choice for climate action, relative to REF GDP baseline



Source: World Bank MANAGE simulations. The chart shows deviations from the REF GDP resulting from the way that climate action is financed (debt, spending, tax). In each simulation, FDI worth 0.5 percent of REF GDP is also assumed. The no climate action line shows the impact of climate damages (absent climate action) in REF.

4.2.1 Structural reforms are critical to expand fiscal space

Raising more resources domestically is imperative; this requires structural reforms alongside tax reforms to expand the tax base. Ethiopia's tax-to-GDP ratio, currently below 7 percent, is insufficient to fund essential spending, to anchor fiscal sustainability over the medium term, or to drive an acceleration in growth through productive investments.⁹³ Low revenues (along with lower donor flows) are also a factor behind monetary financing of the deficit and related high inflation. The low tax effort reflects the erosion in the tax base and the formal, tradable (and taxable) private sector due to the large state-owned enterprise (SOE) footprint and related policy distortions, high informality (especially in urban areas), a high share of small-scale agriculture in total output,⁹⁴ and substantial tax expenditures. Many loss-making SOEs absorb significant amounts of scarce fiscal revenues; however, the SOE tax regime is not uniformly applied.⁹⁵ Addressing these distortions will help broaden the tax base and anchor macro-fiscal sustainability and generate the needed resources to finance the agricultural, water, and energy investments needed for Ethiopia to benefit from a changing climate.

These need to be complemented by tax policy and administration reforms. Priorities include the elimination of tax expenditures and exemptions, reforms of the policy and compliance gaps in VAT, excise, customs, and personal income tax, and implementation of the newly introduced property tax. From a climate perspective, the undercharging of excise and VAT on fuel is a potential area of reform,⁹⁶ as is the introduction of a motor vehicle circulation tax. The redesign of motor vehicle import taxes by basing these on CO₂ and particulate emissions (e.g., using Euro standards), rather than engine size or vehicle age as is generally the case currently, can facilitate the replacement of older quality vehicles, and reduce related emissions. The revenues generated could potentially finance climate investments in the transport sector.

Subsidy reforms can provide some savings; scope for additional cuts is limited; it is imperative to use scarce resources well. Total expenditure on climate change adaptation and mitigation-related items accounted for less than 0.04 percent of GDP in 2020, compared to spending on fossil fuel subsidies (1.5 percent of GDP). The government should build on existing initiatives of phasing out fossil fuel subsidies and rationalizing electricity tariffs (while expanding access and reliability of supply). This will increase fiscal space, enhance financial sustainability of SOEs, and ease energy shortages for firms. Spending-to-GDP ratios have more than halved since the 2000s to just 10 percent in FY23; this makes it urgent that every birr is spent on well-targeted sectoral interventions/investments to boost climate resilience or strengthen safety nets in areas where climate impacts will be the greatest (e.g., the lowlands).

Advancing on fundamental SOE reforms is a prerequisite for SOE-related climate actions to bear results. Some sector-specific SOE reforms can help to catalyze better climate-related outcomes. For instance, the underutilization of the Addis-Djibouti rail network is a challenge that arises, in part, from the presence of an inefficient rail SOE and insufficient capital investment/maintenance. Logistics costs as high as 30 percent of GDP partly stem from heavy reliance on surface transport along the Addis-Djibouti route⁹⁷ where logistics are dominated by an SOE. State-owned industrial parks can facilitate adoption of sustainable manufacturing practices through proper regulatory and incentives mechanisms. More broadly, climate change is weakly integrated into Ethiopia's SOE governance models. Alongside

93 Gaspar, Vitor, Laura Jaramillo, and Philippe Wingender. 2016. "Tax Capacity and Growth: Is There a Tipping Point?" International Monetary Fund.

94 Seid, Edris and Ben Waltmann. 2023. "Why does Ethiopia collect so little tax?" Institute of Fiscal Studies Presentation to Ministry of Finance, FDRE, on May 30, 2023.

95 Agence Française de Développement. 2022. AFD and State-Owned Enterprises: Financial Support and Strengthening of Governance. ([HERE](#))

- 96 The Ethiopian Petroleum Supply Enterprise (EPSE), which manages fuel taxes, charges lower rates of excise duty and VAT than are legislated for: excise of 9% rather than 30% is charged on gasoline, and VAT of 5% rather than 15% is charged on both gasoline and diesel. IFS. 2021. "Green' Motor Taxation: Issues and Policy Options in Sub-Saharan Africa." Institute for Fiscal Studies.
- 97 Mostly operated by high diesel-consuming old fleet on old road infrastructure. The bulk of Ethiopia's imports and exports are transported via this route.

weak corporate governance practices and reporting, this limits SOE accountability for much-needed climate adaptation and mitigation actions in strategies, investment projects, and operations. Specific SOEs are key in implementation of CRGE and NDCs, e.g., Ethiopia Electric Power. In these cases, by the nature of their responsibilities, climate change considerations would be fully incorporated through sector frameworks and coordination. In other cases, like for Ethiopia Airlines, market pressures requiring the greening of operations is already contributing to mainstreaming of climate change into corporate strategies. That said, it will be important to get basic reforms for SOEs in place (Box 6) before climate-related actions (such as incorporation of climate considerations into SOE governance frameworks) can generate payoffs.

Box 6: The SOE Sector in Ethiopia

SOEs have been major economic players in Ethiopia for decades, dominating the energy, railway, logistics, telecom, manufacturing, agriculture, retail and trading, and construction sectors. By some estimates, the SOE sector in Ethiopia accounted for about 30 percent of GDP in 2018, with some 43 SOEs and 5 subsidiaries owned by the federal government as of June 30, 2022. These SOEs are under the ownership and/or management of Ethiopian Investment Holdings (EIH), Public Enterprises Holding and Administration Agency (PEHAA), and few other line ministries. There are additional SOEs owned by regional governments and city administrations for which data and information is not available. It is estimated that SOE assets represent 68 percent of GDP in 2022 and represent 44 percent of outstanding credit as of 2022. In addition, federally-owned SOEs account for a significant share of formal employment in the country, employing more than 205,000 people at end 2019.

Key challenges include weak governance and oversight, high indebtedness, poor investment management, weak fiscal and operational discipline, and poor quality and late delivery of audited financial statements. Reform priorities include: alignment of the legal framework viz. ownership and oversight of SOEs among key stakeholders among MoF, EIH, PEHAA and line ministries; clear articulation of the rationale for state ownership; reform of public service obligations; strengthened fiscal oversight and monitoring of risks; institutional accountability and capability to effectively

4.2.2 Enabling the private sector

The private sector in Ethiopia is increasingly cognizant of the need to adapt and mitigate e.g., through implementing climate risk assessments, investing in climate-resilient infrastructure, and incorporating sustainable practices into its operations. Private sector can also help to transfer innovative practices on climate-smart agriculture development to smallholder farmers, promoting higher, more resilient livelihoods.⁹⁸

However, macro, regulatory and policy distortions constrain the private sector's participation in the economy in general. Reforms tackling exchange rate overvaluation, product and factor market distortions, export barriers, and logistical constraints and financial repression are needed to spur the transition to a market economy and private sector-led investment and growth. Backed by subsidized government credit and dominating key sectors, SOEs have crowded out the private sector, making their reform urgent over the medium term.

Active private sector participation in the climate agenda in addition requires inclusive and participatory decision-making process and better coordination at different levels of government. Poor coordination, misalignment of priorities, and lack of institutional accountability amongst various state

- 98 Under an IFC advisory project, Soufflet Malt Ethiopia (FDI) is locally sourcing 100 percent of raw material (Malt Barely) from the smallholder farmers and helping the farmers to get access to improved seeds and to train them in climate-smart agronomic practices. This has increased the revenue of the farmers and has enhanced their livelihood opportunities and increased resilience.

agencies is visible across both vertical and horizontal governance structures. Regulatory frameworks and directives often lack clear guidelines and incentives for private sector involvement and need to be developed/strengthened as stipulated in Proclamation 1183/2020 to assure the participation of the private sector. Inclusive and participatory decision-making processes that involve the private sector in policy formulation can be supported through strong private-public dialogue platforms. To further unlock the potential of the private sector, policy makers should also facilitate access to financing for climate change projects and invest in capacity-building initiatives for the private sector to enhance technical skills and knowledge.

The deployment of PPPs in Ethiopia remains nascent, despite reforms to the legal and institutional framework in recent years to support transparent and competitive selection and implementation of PPPs, and to expand the role of the private sector. Slow PPP uptake, including in climate-critical sectors such as renewable energy, is due to investor concerns about exchange rate availability, convertibility, and transferability.⁹⁹ Recent amendments to the PPP Proclamation allowing for directly negotiated projects have created opportunities for private developers such as MASDAR (solar) and AMEA Power (wind), but come at the cost of undermining competitiveness and transparency. Going forward, it is important that the government maintain transparency and a level playing field in all PPP transactions, monitor and incorporate related contingent liability risks into its fiscal risk statement, and directly address the exchange rate–related bottlenecks through exchange rate reforms.

Trade offers another lever to support private sector-led adjustment to climate shocks and greener growth. Trade in Ethiopia amounts to only a quarter of GDP (vs half in Sub-Saharan Africa), and the secular decline in the export-to-GDP ratio to just 8 percent in 2022 has exacerbated the country's external financing and debt vulnerabilities. Trade integration and external competitiveness have been undermined by the usual macro-exchange rate distortions, and by high tariff and non-tariff barriers and FX surrender requirements, poor trade logistics and trade facilitation, and underdeveloped trade infrastructure. The accession to the WTO is also still pending. These challenges will need to be addressed to leverage the full potential of trade to drive structural transformation, build climate resilience, and facilitate green growth through imports of clean, energy-efficient technologies. Accession to the WTO would provide opportunities for reaping the benefits of special and differential treatment to which Ethiopia is entitled as a low-income country.

Ethiopia's financial sector must do more to support the real economy and build resilience to climate change. Ethiopia's bank-centric financial system¹⁰⁰ is characterized by low insurance market penetration, high directed lending to the public sector, the absence of capital markets, low financial intermediation to the private sector, and limited financing for climate adaptation and mitigation. Reforms under way to improve financial sector stability and depth and strengthen the regulatory and supervisory framework include: addressing the nexus between state-owned banks and SOEs, the opening of the banking sector to foreign investment; establishment of deposit insurance; and increasing insurance market penetration. Ongoing reforms to develop capital markets will also provide an avenue for the issuance and exchange of climate finance instruments such as green bonds and support private capital mobilization over the medium term. It is expected that the commercial banks will be among the first set of issuers, which will enhance their capital and correspondingly their lending capacity to support climate-friendly projects. Given the importance of agriculture to the economy and its susceptibility to climate shocks, policy interventions should continue to focus on expanding access to finance for the agriculture sector e.g., through factoring, warehouse receipts and leasing, alongside greater access to insurance.

- 99 That said, there has been some progress: for example, the World Bank's Ethiopia Renewable Energy Guarantees Program (REGREP) supports a remarkable transition from public sector-led energy sector development to private sector-driven expansion of new generation capacity and is expected to mobilize over US\$1.5b in investment for at least 1,000 MW of renewable energy (solar and wind) IPPs in Ethiopia over a period of six years.
- 100 There are 30 banks accounting for 93 percent of the financial sector assets. Sixty percent of banking assets are dominated by two public banks allocating capital mainly to the public sector/SOEs.

The National Bank of Ethiopia (NBE) should move to integrate climate-related financial risks in its prudential supervision. Like many other central banks globally, the NBE should begin to strengthen financial sector regulation to better manage climate-related and environmental physical and transition risks. As a first step, it should join the Network for Greening the Financial System (NGFS) that can help build capacity by bridging gaps in data and advance modeling of climate risks, and support risk-based supervision through the identification of the most vulnerable sectors and firms. The NBE should consider preparing guidelines to implement the Basel Committee on Banking Supervision Principle for effective management and supervision of climate related financial risk. These guidelines will set forth expectations on governance, risk management, internal controls of climate risk, and the incorporation of these risks in the banks' capital and liquidity planning. This is in line with the implementation of Basel II/III. Guidelines should be implemented with proportionality, but without diluting the robustness of the standards. They should be tailored to the countries context and will certainly contribute to raise awareness. Moreover, the Ethiopian Accounting Standard Board should consider implementing the upcoming International Financial Reporting Standards (IFRS) S2 standard on climate-related disclosure.

The green finance market is relatively nonexistent in Ethiopia. While local financial institutions fund green projects, these loans are treated as any other loan. The development of a green finance taxonomy that covers, inter alia, the definition and identification of green assets, implementation, and financing will help to grow the market. Additionally, the development of a green finance strategy would help address key barriers to mobilizing green finance such as high perceived risks, large financing needs, and long tenors. The lack of de-risking instruments such as guarantees and credit enhancements are an impediment to access to finance for renewable energy infrastructure. Such enablers would help to improve companies' credit profile and attract bank funding. Additionally, developing the voluntary carbon/biodiversity credit markets can help to provide an additional source of repayment and funding for further investments. Unlocking this source of funding will require a transparent framework for project structuring, issuance and exchange of carbon credits, and carbon tax revenue use.

4.2.3 Managing residual risks

The country will have to find new ways of insuring against climate risks, and better managing residual risks. As noted, droughts, floods, and related food insecurity are the primary drivers of disaster response costs in Ethiopia and carry significant fiscal costs. Financial protection complemented by identification, risk reduction, preparedness, and resilience measures are critical alongside a well-diversified disaster risk layering strategy. Currently, climate risks are considered in Ethiopia's fiscal risk statements, but linkages to macroeconomic and fiscal framework and budget functional allocations need strengthening. The country is also largely reliant on ad-hoc ex-post financing in response to disasters—primarily ODA and humanitarian appeals, budgetary reallocations, and emergency borrowing.¹⁰¹ The dependency on external funding, especially humanitarian appeals, provides uncertain, insufficient, or delayed resources. That said, it is neither cost-effective nor feasible for countries such as Ethiopia with significant development needs and extremely high levels of poverty to set aside hundreds of millions of dollars. Instead, a better strategy is to lessen the impact of disasters and better manage residual risks.

While Ethiopia has some mechanisms to finance disaster response, these should be optimized to improve the efficiency and efficacy of disaster response expenditures, including for climate. The MoF should develop and adopt a national Disaster Risk Financing Strategy to identify and assess the suitability of potential financing instruments for climate shocks of varying intensity, and their alignment with existing financial mechanisms. To address the lack of robust data on disaster expenditures, Ethiopia should establish a comprehensive climate disaster expenditure tracking system, and continue investments in early warning systems and delivery mechanisms to ensure funds reach those affected.

101 Annual aid requests range from US\$0.85 billion to US\$2.8 billion, comprising 27 percent of the budget, with needs escalating in the aftermath of shocks.

In the medium term, to reduce dependency on the ex-post aid financing and humanitarian appeals system that often provides uncertain, insufficient, or delayed resources, the government needs to build financial protection at local levels and enable the private sector to take on more risk. Currently under-utilized instruments include contingency credit, insurance for both public and private sectors,¹⁰² well-planned budget reallocations to minimize opportunity cost, and ring-fenced and tightly regulated funds.¹⁰³ As and when broader market access is restored, Ethiopia should consider the incorporation of debt “pause clauses” in its debt instruments¹⁰⁴ and, related to this, explore the identification of suitable triggers for slow-moving climate disasters such as droughts. It should also consider participating in risk-transfer facilities, for example through the African Risk Capacity Agency (a specialist agency of the African Union) that provides sovereign disaster risk insurance and risk-pooling services.

4.2.4 Mobilizing external and blended finance: options for Ethiopia

Although promising, innovative/blended financing flows are currently too small; even so, Ethiopia should strengthen processes and capacities for better leveraging these over the medium term. New financing instruments, although innovative, currently lack scale. Financing innovations such as structured-impact bonds, green/blue bonds, emission-reduction linked bonds, sustainability-linked bonds, and debt-for-nature swaps (see Box 7) hold significant promise to attract investors with different risk profiles and investment horizons, potentially free up fiscal space, and reduce hurdle rates for privately funded climate investments. Several global financial intermediary funds also exist that blend finance and channel resources towards climate action: Ethiopia’s MoF is relatively advantaged compared to other developing countries in being one of the few public direct accredited agencies to access resources from the Green Climate Fund (GCF)¹⁰⁵ (up to US\$50 million¹⁰⁶) and Adaptation Fund; eventually, these plus others such as the Global Environmental Facility could eventually be a source of around US\$1.3bn in annual funding in best-case scenarios. At the moment though, current flows from these sources are too small for impact and relative to needs and directed mostly towards nature conservation and/or mitigation projects (vs adaptation).

In the meantime, Ethiopia should maximize concessional/grant resource envelopes through policy reforms. Grant/concessional finance will, for the foreseeable future, remain the most important (and the cheapest) source of external finance for climate purposes. With multilateral resource envelopes hinging on performance-based allocation (PBA) formulas, it is critical that Ethiopia implements the stronger policies that underpin these PBAs or access to new concessional financing windows such as the IMF’s Resilience and Sustainability Trust.¹⁰⁷ As recent experience suggests, slippage in policy and institutional reforms could entail a reduction in the volume of critically needed concessional financing.¹⁰⁸

To tap the full potential of blended finance in the long term, Ethiopia must strengthen basic capacities to mobilize, track, monitor and report climate resources. This requires addressing significant weaknesses in relation to mobilization, management, and reporting of climate flows.

¹⁰² It is important to build bespoke DRF instruments such as insurance, not only at the level of the government but also for individuals, the poor and vulnerable, SMEs, large corporates, and vulnerable sectors such as insurance. Ethiopia’s insurance market penetration is one of the lowest in Sub-Saharan Africa and most of the premiums underwritten are for auto insurance. Parametric insurance, micro-insurance, and agriculture insurance are not yet developed in the country. There is therefore tremendous room for improving the role of the insurance sector in minimizing the financial consequences of climate change.

¹⁰³ World Bank. 2022. Climate and Disaster Risk Finance Diagnostic Report. ([HERE](#))

¹⁰⁴ While debt pause clauses can free up fiscal breathing space in the short term, they should not be considered a substitute for protracted financing problems.

¹⁰⁵ GCF’s financial instruments also include contingent grants, concessional loans, equity, guarantees and results-based finance.

¹⁰⁶ MoF is targeting upgrading its accreditation to manage projects up to US\$250 million.

¹⁰⁷ As of June 2023, the IMF Board had approved the first five pilot Resilience and Sustainability Facility (RSF)-supported programs

(Barbados, Costa Rica, Rwanda, Bangladesh, and Jamaica). About three-quarters of the Fund membership (143 countries) are eligible to receive financing from the RST. Members with concurrent, on-track UCT-quality IMF-supported programs can access resources from the RST through the Resilience and Sustainability Facility (RSF).

108 As authorities failed to implement one of the Policy and Performance Actions (PPA) under the Bank's Sustainable Development Finance Policy (SDFP) in FY22, about US\$333 million of Ethiopia's IDA allocation was temporarily unavailable (set aside) in FY23.

Although the CRGE facility's remit covers mobilization, management, and reporting from external and internal, and public and private sources, it has mainly been focused on external finance (which in turn suffers from a lack of coherent reporting).¹⁰⁹ To improve transparency, the GoE should provide reliable, up-to-date and comprehensive information on external climate flows and their use; publish climate expenditure information in the budget, including as part of the citizen's budget, and publish outturn information; publish all appraisals of public investment projects; and enforce transparency provisions in public procurement laws and regulations. Building public sector capacity to develop bankable projects, especially for adaptation, is also critical. Strong state capacity and legal frameworks, together with mechanisms to monitor investment projects, will be helpful to ensure that de-risking by the Ethiopian government does not lead to fiscal liabilities.

Box 7: Climate-linked Financial Instruments for Ethiopia

With many developing countries facing growing climate and fiscal vulnerabilities, there has been rising interest in climate-linked financial instruments such as debt-for-nature swaps (DNS), and sustainability-linked bonds (SLBs). Debt-for-nature swaps, which have been part of the debt restructuring landscape since the Latin American crisis, reduce debt in exchange for debtors' investment in nature conservation and climate at a fiscal cost no higher than the debt reduction. They can, thus, help to free up fiscal resources while aiding climate action or conservancy, as Seychelles, Belize, and many other countries have done. In Belize in 2021, for instance, The Nature Conservancy (TNC) arranged a "blue loan" to the government to finance a bond-for-cash exchange at 55 cents per dollar of face value of a US\$553mn sovereign bond (a fairly steep discount), with US-provided "political risk insurance" substantially lowering the credit risk associated with the transaction to the TNC. In contrast to DNS (which typically are much smaller in size than in Belize, and are quite widely used), only two countries, Chile and Uruguay, have issued SLBs, raising \$2bn and \$1.5bn respectively in 2022. Unlike green bonds, whose use of proceeds are limited to investment in green activities or products, such as a wind farm, SLBs tie issuance and the financial terms of the bond to key performance indicators linked to national climate or environmental targets. Both look attractive options over the medium term for Ethiopia, as it completes its ongoing debt restructuring and regains market access. When debt sustainability improves, SLBs with guarantees from partners like the African Development

Well planned carbon-offset generating projects can deliver significant co-benefits to biodiversity, adaptation, and local communities exposed to climate shocks. Ethiopia has been active in the voluntary carbon market (VCM),¹¹⁰ generating tradable offsets since as early as 2008, trading certified emissions reductions (CERs).¹¹¹ Between 2008–21, Ethiopia generated nearly 10 million voluntary emissions reductions, 9 million of these coming from the Bale Mountains Eco-Region REDD+ project, administered by the Oromia Forest and Wildlife Enterprise (OFWE)¹¹² and registered under the Washington-based Verified Carbon Standard (VCS). The success of this shows that with the right approach to community mobilization, transparency, and inclusion on decision-making and innovation in strengthening livelihoods, the benefits of climate and carbon funding can reach deeply into forest communities and deliver the intended benefits.

109 Due to a failure to maintain a public CRGE registry for CRGE projects, as lack of transparency on all development partner financing. Not all externally financed projects with climate objectives flow through the CRGE facility.

110 Rather than trading officially issued carbon credits, which represent an emissions allowance for corporations within a regulated framework, participants in the VCM trade in carbon offsets, known as verified emissions reductions (VERs).

111 Ethiopia became the first country in Africa to generate UN-administered offsets in 2009 (though work began in 2006) with the Humbo Assisted Natural Regeneration project, which rehabilitated over 2,700 hectares of land under the management of World Vision and the Ethiopian Forestry Department

112 The project, initiated with funding from Norway in 2006, is the country's first REDD+ project, covering 260,000 hectares of forest. It began generating credits in 2012. An ambitious integrated landscape management project, it reduced deforestation and boosted the livelihoods of local communities in the Bale Eco-region. Over the project period, deforestation in the Bale Eco-region was 58 percent lower than projected in the absence of the

project.

4.3 Supporting the most vulnerable

Structural transformation and the related expansion in private market opportunities are fundamental for raising incomes and bolstering resilience in Ethiopia, including to climate shocks, and dampening fragility risks. Ethiopia needs to ensure a more inclusive economy and labor market by increasing access to decent jobs, incomes, and entrepreneurship opportunities for vulnerable groups, expanding rural land registration to the pastoral lowlands, as well as eliminating agriculture marketing and pricing restrictions where they still exist (e.g., maize export controls). In addition, it needs to address constraints to labor mobility by streamlining the administrative process required for migrants to integrate into urban areas (e.g., reducing minimum residency requirements) and by improving services that connect people to jobs (e.g., strengthening job intermediation services and supporting youth apprenticeships). Supporting inclusive recovery and growth should also include boosting market opportunities for smallholder farmers by reducing the distortions in the agriculture sector, supporting the development of agriculture technologies critical for generation of more resilient varieties, and improving natural resource governance.

Ethiopia's safety net system has a strong track record and supports climate change adaptation, but adequacy, capacity, adaptability, and systems need strengthening. In addition to improving food security and livelihoods through their public works components,¹¹³ both the more mature rural and the relatively new urban safety net programs have supported climate change adaptation and mitigation (Box 8). However, adequacy and coverage of these programs have suffered due to high inflation, multiple compound shocks, and fiscal pressures. The sustainable financing of these programs and nascent social protection systems such as social registries, digital payment mechanisms, and a management information system continue to be a huge challenge. At 1.02 percent of GDP, Ethiopia's spending on social protection is lower than the Sub-Saharan Africa (SSA) average of 1.14 percent. Key reform priorities include developing digital, interoperable systems for social protection programs, and expanding coverage to include a larger portion of the rural and urban poor and vulnerable, and through targeted interventions to ensure the inclusion and protection of those most in need, including, for example, informal workers, people with disabilities, internally displaced people, returnees and refugees. Second, Ethiopia must strengthen coordination with humanitarian assistance programs to enhance the shock- responsiveness of the safety net systems. Third, it should increase the level of and value of money, including through increased allocations to the financing of safety nets and reducing reliance on donor financing. Fourth, Ethiopia should better link social protection programs to social services, to boost human capital outcomes.

Increased financial inclusion is another priority area of intervention. Financial inclusion has improved in Ethiopia over the past 4 years,¹¹⁴ supported by regulatory reforms supporting the delivery of payment services by foreign telecoms, fin-techs and banks; revision of the national financial inclusion strategy with a focus on digital financial service; and full operationalization of the movable collateral registry system. Continuing the momentum of liberalizing the financial sector in a way that enhances the participation of the private sector—both domestic and foreign—is crucial to further improve financial inclusion.

¹¹³ The rural safety net has contributed to improvements in food security, agricultural income, and accumulation of livestock while reducing the distress sale of assets during shocks. Through the urban safety net, households increasingly engage in income-generating activities, enhancing their income and

saving. The community-based health insurance is increasing the frequency of health service utilization amongst the poor and reducing households' out-of-pocket expenditure, which can be a big driver of regression to poverty. School feeding programs are increasing net enrolment attendance and attentiveness levels while reducing school dropout rates.

- 114 According to the latest Findex Survey, there was an 11 percent increase in financial inclusion (as measured by account ownership) from 35 percent in 2017 to 46 percent in 2022. The growing microfinance (MFI) sector in Ethiopia has played an important role in expanding financial inclusion for the unbanked and underbanked segment of the society. There are currently 43 MFIs in Ethiopia serving more than five million loan customers, a much greater number than the 350,000 loan clients served by banks.

Box 8: Climate Change Adaptation and Mitigation Benefits from Ethiopia's Social Safety Net Program

The largest of Ethiopia's social protection programs, the Productive Safety Net Program (PSNP), supports around 10 percent of the rural population. Transfers build climate resilience by avoiding distress sales of household assets and promoting savings. In return for transfers, public works (PW) build further resilience that support increased agricultural productivity and food production; improved access to water, income generation, and livelihoods; and better nutrition, education and health.¹¹⁵ The support program ensuring that these activities are climate-smart costs only \$7mn, representing just 0.27 percent of the PSNP budget of \$2.6 billion.

By increasing biomass, the PW program sequesters more carbon in the soil, increasing soil fertility.¹¹⁶ It also significantly reduces climate change impacts through watershed and rangelands rehabilitation, and reduces the risk of landslides and floods, soil erosion, and sedimentation, thus protecting social infrastructure that are subject to climate risks, such as health and education facilities.¹¹⁷ Increased vegetation cover and biomass production resulting from PW activities such as terracing, tree-planting and gully reclamation planting, contribute to mitigation. In 2015, the mean carbon benefit of 28 representative PW sites was found to be 5.7 tons equiv. CO₂/ha/annum, implying a carbon benefit of around 3.4 million tons sequestered/annum in 600,000 ha of area enclosures. This showed that the public works are "climate smart, achieving mitigation impacts comparable to the largest carbon projects currently

115 In 2019 the average increase in crop yields attributable to the PSNP PW program was 13 percent, reaching a level of 40 percent in one highland watershed. SuDCA Development Consultants, PSNP Phase IV Public Works Impact Assessment, Final Report, Nov. 2019.

116 A Cornell University team determined that increased soil carbon stocks resulting from the PW resulted in up to 3.5 times higher critical macronutrient concentrations in the surface and deep soil profiles of the PW watersheds. Solomon, D. et al. 2015. Ethiopia's Productive Safety Net Program (PSNP): Soil carbon and fertility impact assessment. Cornell University, pp. 13–14, 50, 61.

117 In 10 watersheds and rangeland units, the average reduction in soil erosion from 2005 to 2009 was 36 percent. Where soil erosion was a highly significant problem, the reduction was 65 percent. SuDCA Development Consultants, Nov. 2019.

118 Woolf, D. et al. 2015. Climate Change Mitigation Potential of Ethiopia's Productive Safety-Net Program (PSNP). A World Bank Climate-Smart Initiative (CSI) Report. Cornell University, pp. 7, 12.



5

PRIORITY POLICY ACTIONS AND INVESTMENTS





Priority Policy Actions and Investments

Ethiopia's initial conditions are those of macroeconomic and social fragility, stalled structural transformation, high levels of climate vulnerability, and an acute shortage of resources to finance development—let alone climate action. The sector-level impacts of climate change, each significant and important, add up and have a negative impact at the economy-wide scale—especially under business-as-usual policies that will constrain growth over the medium to long term—and will translate into a considerable increase in variability across years and regions. Cumulatively, and especially in the case of extreme climate shocks that are expected to occur more frequently, they will exert a drag on development, household welfare, and increase social disparities. Although the CCDD does not examine potential future interaction between climate change and fragility, the fact remains that Ethiopia is a country with widespread localized conflict, where 2 million young people enter the labor market every year, and where climate, macro-vulnerability and social heterogeneity could interact to further compound risks. Climate interventions should also be delivered in a manner that limits the potential for maladaptation, alongside seeking to prioritize activities that address root causes of fragility where relevant.

CCDD findings confirm that development as usual will not suffice. Absent reforms to accelerate Ethiopia's delayed structural transformation, it will not be possible to build broad-based resilience to climate impacts (at the household, firm, and macro level), or to mobilize resources (both domestic or external) to finance the needed climate investments. It will also need to find new ways to insure against, and better manage, residual climate risks. Expanding the role of the private sector in future growth, in participating in climate action, and to mitigate risk will be pivotal and one key objective of these structural reforms.

Amid resource constraints, additional and, in some areas, better targeted *existing* policies and investments are required to adapt and to ensure that Ethiopia reaches its development goals. CCDD findings suggest that climate impacts will be concentrated among key types of infrastructure (e.g., bridges more than roads), spatially (land degradation will become more severe due to climate change in the lowlands), and by sector (with larger adverse impacts on livestock anticipated and marginally positive impacts on crops). Ethiopia can also refocus/better target existing investments towards the most vulnerable sectors and geographical areas. These include land restoration in lowlands to support crop-yields and strengthened capacity and resources at the subnational level. Strengthening climate governance is critical to ensure the desired outcomes from climate action, both at the national and subnational level. Ethiopia's social protection programs, although a critical lifeline for poor rural and urban households and an important support to climate adaptation and resilience building for households, are significantly challenged in terms of systems, adequacy, capacity, and financial sustainability. Social protection programs will also need to be strengthened.

Table 5.1 provides a summary of priority actions for the short term (1–3 years) and medium term (more than 3 years).¹¹⁹

119 Prioritization screening of recommendations such as that used by the GoE in the updated NDCs is beyond the scope. The recommendations have however been broadly split into the length of time it will take to be implemented. Short-term (1-3 years) and Medium-term (>3 years).

Table 5.1. Priority 1: Accelerate implementation of structural reforms and promote social safety net programs

Priority Actions	Recommended Actions	
	Short term (1–3 years)	Medium term (>3 years)
Priority 1: Accelerate implementation of structural reforms and promote social safety net programs	<ul style="list-style-type: none"> • Reform exchange rate, monetary, and fiscal policies, and implement structural reforms to ease regulatory and policy distortions in product and factor markets, logistics, and trade. Reduce tax expenditures and undertake tax policy and administration reforms to broaden tax base. • Maintain transparency in all PPP transactions, monitor and incorporate related contingent liability risks into fiscal risk statement, and directly address FX-related bottlenecks to PPP transactions through FX reforms. • Continue reforms to liberalize banking sector and deepen insurance and capital markets; side by side, develop a green finance taxonomy and strategy to address some of the key barriers to green finance in relation to high perceived risks, large financing needs, and long tenures. Develop de-risking instruments such as guarantees and credit enhancements. • Develop and adopt a national disaster risk financing strategy and establish a comprehensive climate disaster expenditure tracking system; continue investments in early warning systems and delivery mechanisms. Budget reallocations should be well-planned to minimize opportunity cost and be ring-fenced and tightly regulated. 	<ul style="list-style-type: none"> • Build financial protection at local levels and enable the private sector to take on more risk through insurance and risk pooling/transfer facilities and instruments. • Incorporate climate-related debt pause clauses in debt instruments; the Ethiopian Accounting Standard Board should implement the upcoming IFRS S2 on climate-related disclosure. • Continue with SOE reforms; integrate climate into SOE governance models; adopt a framework for climate-linked performance-based financing criteria, monitoring, and reporting by SOEs. • Reform trade barriers to facilitate imports of clean, energy-efficient technologies. Accelerate trade reforms (WTO and AfCFTA).
Strengthen climate governance and social safety net programs		

	<ul style="list-style-type: none"> Amend (or complement by other legal instruments) the Environmental Impact Assessment Proclamation; revise sector-specific guidelines to explicitly require public and private project proponents to consider the GHG impacts of these projects and their resilience to climate change; revise and strengthen climate strategy monitoring and NDC MRV, including establishing open, consistent, comprehensive, integrated but appropriately cascaded climate strategic and results frameworks. These may initially be on a sector basis, leveraging the updated NDC result frameworks. 	<ul style="list-style-type: none"> Strengthen adequacy, capacity, adaptability and systems of social protection programs, including by developing digital, interoperable systems, expanding coverage to include a larger portion of the rural and urban poor and vulnerable, ensure protection of those most in need, and increased adequacy and sustainability of financing through budget. Streamline administrative process for rural to urban migration (e.g., reducing minimum residency requirements). Strengthen coordination with humanitarian assistance programs; improve sustainable financing; better link social protection programs to social services, to boost human capital outcomes; increase the level of funding and value for money of spending on social protection.
Priority Actions	Recommended Actions	
Priority 2: Invest in climate-resilient infrastructure	<p>Existing infrastructure needs to be managed so that it is more resilient to climate-change related shocks:</p> <ul style="list-style-type: none"> Transport: Strategic maintenance plans need to be sufficiently budgeted and executed. While the government has invested in transport asset management systems, considerations for climate resilience need to be incorporated in the asset management process from planning, design, and construction, to maintenance and emergency response and repair. Energy: Electric utilities need to develop preparedness and resiliency plans to respond to natural hazards effectively and efficiently. 	<p>New infrastructure, including that aimed at climate adaptation, needs to be designed in ways that are less vulnerable to climate change:</p> <ul style="list-style-type: none"> Water: Increase efficiency and safety of existing storage and the spectrum of multipurpose storage; support integrated watershed management to increase groundwater recharge; reduce siltation in dams and reservoirs. Energy: Design energy systems to be climate-resilient; diversify electricity generation mix— supplement with solar, wind and geothermal; modernize load dispatch and system defence to address system vulnerabilities that can cause black-outs; strengthen reservoir management and water availability forecast systems to ensure optimal use of water across different uses; construct regional power interconnections to enable electricity trade to balance demand-supply variations and decarbonize energy systems in the region; reinvigorate the competitive tenders for renewable energy IPPs to diversify the energy mix after the macroeconomic constraints are overcome. Additionally, a regional power trade can contribute to the decarbonization efforts of neighbouring countries and

		<p>generate fiscal revenue for Ethiopia.</p> <ul style="list-style-type: none"> • Transport: Develop an integrated multimodal transport network to improve the redundancy of the network and ensure uninterrupted movement of people and goods. • Urban: Grey (technical) and green (nature- based) solutions are recommended to mitigate urban disaster risks such as flooding, landslides, and heat stress.
	<p>Policy reforms to promote climate action in public investment and procurement must be considered:</p> <ul style="list-style-type: none"> • Strengthen climate risk assessments in Public Investment Management Guidelines under Proclamation 1210/2020; Incorporate climate co- benefits (green public procurement provisions) into public procurement across the procurement cycle. • Assign weights to green bids, and expenditures that would build resilience in public procurement frameworks; prepare and implement green procurement strategy; and strengthen capacity to ensure prioritization of sectors vulnerable to climate change. • Incorporate climate co-benefits into the management of public assets; record critical or at-risk infrastructure assets into asset registers. • Streamline the application of sustainable procurement and green public procurement requirements in all public procurement processes and contract management. 	

Priority Actions	Recommended Actions	
Priority 3: Support greater decentralization of climate response	Key sector-specific recommendations:	
	<ul style="list-style-type: none"> • LUCF: Implement land restoration and management practices as planned under existing government programs but improve targeting towards lowlands and areas with the greatest potential to improve ecosystem services. 	<ul style="list-style-type: none"> • LUCF: Land management investments should be accompanied by expansion of rural land registration in the pastoral lowlands, to incorporate pastoralists' rights and strengthen their customary land administration institutions, grounded in localized understanding of social dynamics and potential drivers of conflict. • Agriculture: Build a productive, resilient livestock economy through targeted adaptation measures and implement climate-smart agricultural practices including: i) conservation agriculture (e.g., substituting pasture losses with imported feed and implementing heat abatement measures such as sprinklers and fans on commercial cattle dairy farming); ii) improved crop variety and diversification (e.g., implementing autonomous adjustments such as the full use of improved seeds and fertilizer); and iii) soil and water management (e.g., soil management practices, including conservation tillage and application of crop residues after harvest).
	Increase strategic and financial capacity for climate change at subnational and national level:	
	<ul style="list-style-type: none"> • Continue reforms to liberalize the banking sector and deepen insurance and capital markets. Policy interventions should focus on expanding access to finance and insurance options for the agriculture sector, given its importance to the economy and vulnerability to climate change. • For greater private sector participation in the climate agenda: Improve coordination, better align priorities, and enhance accountability across public agencies by strengthening the relevant regulatory frameworks and directives as stipulated in the Administrative Procedure Proclamation (1183/2020). 	<ul style="list-style-type: none"> • The central bank should integrate climate- related financial risks into its supervision frameworks, while the Ethiopian Accounting Standard Board should implement the upcoming IFRS S2 on climate-related disclosure. • Support job-rich private sector growth by eliminating agriculture marketing and pricing restrictions (e.g. maize export controls); increase labor mobility by streamlining the administrative process for migrants to integrate into urban areas; improve job intermediation services and youth apprenticeships.

	<ul style="list-style-type: none"> • Building on the recent update of the PPP framework, it will be important for the GoE to: i) maintain transparency and ensure a level playing field in all transactions; ii) monitor and incorporate related contingent liability risks into its fiscal risk statement; and iii) develop a green finance taxonomy and strategy to address key barriers to green finance in relation to high perceived risks, large financing needs, and long tenors. • De-risking instruments such as guarantees and credit enhancements will increase access to finance for renewable energy infrastructure. 	
Priority Actions	Recommended Actions	
	<ul style="list-style-type: none"> • Facilitate inclusive regional representation in federal level governance and institutional coordination structures; mainstream climate considerations into next revision of block grant distribution formula; strengthen ongoing efforts to mainstream climate agenda at the subnational level by capacity building support and leveraging the woreda climate risk profiles and processes initiated by the EDRMC. 	

Financing Climate Action	<ul style="list-style-type: none"> • Mobilize more domestic resources domestically and unlock access to grant/concessional resources through structural reforms. By expanding the role of the private sector in the economy, and complemented by tax reforms, structural policy reforms will help to grow the tax base and thus expand fiscal resources. Public resources must be used to support climate action by building on existing initiatives of phasing out fossil fuel subsidies and rationalizing electricity tariffs, and targeted resource spending where vulnerabilities to climate impacts (e.g. lowlands) is greatest or where climate co-benefits can be realized (e.g. green procurement and investment). • Get financial resources flowing to the private sector: Develop a green finance taxonomy and strategy to address some of the key barriers to green finance in relation to high perceived risks, large financing needs, and long tenors and to develop de-risking instruments such as guarantees and credit enhancements. 	<ul style="list-style-type: none"> • Agriculture: Expand the agriculture sector's access to finance through instruments such as factoring, warehouse receipts, and leasing; and access to insurance. • Strengthen state capacity and legal frame- works for bankable blended finance projects, together with mechanisms to monitor invest- ment projects. Financing innovations (e.g. structured-impact bonds, green/blue bonds, emission-reduction linked bonds, sustainabil- ity-linked bonds, and debt-for-nature swaps) hold significant promise to attract investors with different risk profiles and investment hori- zons, potentially free up fiscal space, and re- duce hurdle rates for privately funded climate investments. • Provide reliable, up-to-date, and comprehen- sive information on external and domestic climate flows and their uses, including at CRGE to: i) mobilize, track, monitor and report domestic and external climate flows and their use; ii) publish climate expenditure information on budget, including as part of the Citizens' Budget, on outturn information, and on all appraisals of public investment projects; and iii) enforce transparency provisions in public procurement laws and regulations. • Address residual risks from climate change: Strengthen identification, risk reduction, pre- paredness, and climate disaster expenditure tracking and resilience measures, and develop a well-diversified disaster risk layering strategy. Budget reallocations should be well-planned to minimize opportunity cost and be ring-fenced and tightly regulated. Ethiopia should continue investments in Early Warning Systems and delivery mechanisms; Build financial protection at local levels and enable the private sector to take on more risk through contingency credit and insurance (for both public and private sectors). When broader market access is restored, consider the incorporation of debt "pause clauses" in its debt instruments and participate in sovereign disaster risk insurance and risk pooling services.
---------------------------------	--	---

References

- Abraha T. et al. 2022. "Rapid Urbanization and the Growing Water Risk Challenges in Ethiopia: The Need for Water Sensitive Thinking." *Frontiers in Water*, Vol. 4, June 2022, p.890229.
- Adame, B.O. 2021. "The Ethiopian telecom industry: gaps and recommendations towards meaningful connectivity and a thriving digital ecosystem." *Heliyon*, 7(10), p.e08146.
- Agence Française de Développement. 2022. *AFD and State-Owned Enterprises: Financial Support and Strengthening of Governance*. Paris: AFD.
- Bahru, B. A., et al. 2019. "Drought and child undernutrition in Ethiopia: A longitudinal path analysis." *PLOS ONE*, vol. 14, no. 7, July 2019, p. e0220075.
- Climate Policy Initiative. 2022. *Landscape of Climate Finance in Africa*. San Francisco: Climate Policy Initiative.
- Climate Watch (CAIT). 2023. Ethiopia Country Profile. Washington, DC: World Resources Institute.
- Dercon, S, 2004. "Growth and shocks: evidence from rural Ethiopia." *Journal of Development Economics*, 74(2), pp.309–329.
- EMIS. 2022. Ethiopia: Mining 2022.
- Federal Democratic Republic of Ethiopia. 2007. Climate Change National Adaptation Programme of Action (NAPA). <https://unfccc.int/resource/docs/napa/eth01.pdf>.
- Federal Democratic Republic of Ethiopia. 2010. Growth and Transformation Plan I 2010–2014. [https:// faolex.fao.org/docs/pdf/eth144893.pdf](https://faolex.fao.org/docs/pdf/eth144893.pdf).
- Federal Democratic Republic of Ethiopia. 2016. Growth and Transformation Plan II 2015–2020. [https:// ethiopia.un.org/en/15231-growth-and-transformation-plan-ii](https://ethiopia.un.org/en/15231-growth-and-transformation-plan-ii).
- Federal Democratic Republic of Ethiopia, Ministry of Health. <https://www.moh.gov.et/site/fact-sheets>.
- Federal Democratic Republic of Ethiopia. 2018. National Health Adaptation Plan to Climate Change. <https://www.who.int/publications/m/item/national-health-adaptation-plan-to-climate-change>.
- Federal Democratic Republic of Ethiopia. 2019. Ethiopia's Climate Resilient Green Economy (CRGE) Implementation Progress Report.
- Federal Democratic Republic of Ethiopia. 2020a. Ten Years Development Plan, 2021–2030. [https:// faolex.fao.org/docs/pdf/eth215704.pdf](https://faolex.fao.org/docs/pdf/eth215704.pdf).
- Federal Democratic Republic of Ethiopia. 2020b. A Homegrown Economic Reform Agenda: A Pathway to Prosperity. https://www.mofed.gov.et/media/filer_public/38/78/3878265a-1565-4be4-8ac9-dee9ea1f4f1a/a_homegrown_economic_reform_agenda- a_pathway_to_prosperity - public_version - march_2020-.pdf.
- Federal Democratic Republic of Ethiopia. 2020c. Ethiopia's Climate Resilient Green Economy (CRGE) Strategy (2011–2019) – Implementation Progress Assessment Report.
- Federal Democratic Republic of Ethiopia. 2021a. First Updated Nationally Determined Contribution. https://unfccc.int/sites/default/files/NDC/2022-06/Ethiopia%27s%20updated%20NDC%20JULY%202021%20Submission_.pdf
- Federal Democratic Republic of Ethiopia. 2021b. National Adaptation Plan (NAP) of Ethiopia. [https:// www4.unfccc.int/sites/NAPC/Documents/Parties/NAP-ETH%20FINAL%20VERSION%20%20Mar%202019.pdf](https://www4.unfccc.int/sites/NAPC/Documents/Parties/NAP-ETH%20FINAL%20VERSION%20%20Mar%202019.pdf).
- Federal Democratic Republic of Ethiopia, Ministry of Urban Development and

Infrastructure. 2021c. Urban Planning and Land Reform Project Feasibility Study. Federal Democratic Republic of Ethiopia, Ministry of Urban Development and Construction. 2021d. Draft Revised Urban Policy, June 2021.

Federal Democratic Republic of Ethiopia. 2022a. Ethiopia Damage and Needs Assessment. Federal Democratic Republic of Ethiopia. 2022b. Third National Communication to the UNFCCC.

Federal Democratic Republic of Ethiopia. 2022c. Ethiopia Transport Master Plan: Policy Strategy 2022– 2052. <http://ethiotransport.gov.et/userfiles/media/default/files/summary-report-221109-201100.pdf>

Federal Democratic Republic of Ethiopia. 2023. Long-Term Low Emissions Development Strategy (LT-LEDS). <https://unfccc.int/documents/630312>.

Gaspar, V., L Jaramillo, and P Wingender. 2016. “Tax Capacity and Growth: Is There a Tipping Point?” Washington, DC: International Monetary Fund.

Gebreselassie S. et al. (2016). “Economics of Land Degradation and Improvement in Ethiopia.” In: Nkonya, E., A. Mirzabaev, and J. von Braun (eds), *Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development*. Springer, Cham.

Hill, R.V. and C. Porter, 2017. “Vulnerability to drought and food price shocks: evidence from Ethiopia.” *World Development*, 96, pp.65–77.

Holden, S., K. Deininger, and H. Ghebru. 2009. “Impacts of low-cost land certification on investment and productivity.” *American Journal of Agricultural Economics* 91(2): 359–373.

Hussen T. 2021. “An Overview of Current Ethiopian Tourism.” *Journal of Tourism and Hospitality*. Vol 10: p382.

Institute for Fiscal Studies. 2021. “‘Green’ Motor Taxation: Issues and Policy Options in Sub-Saharan Africa.” London: Institute for Fiscal Studies.

International Trade Administration. Ethiopia – Country Commercial Guide. Washington, DC: ITA.

McKinsey & Company. 2020. “Climate risk and decarbonization: What every mining CEO needs to know.” January 28, 2020. Available at: <https://www.mckinsey.com/capabilities/sustainability/our-insights/climate-risk-and-decarbonization-what-every-mining-ceo-needs-to-know>.

Mekonnen, D.K., G.T. Abate and Seid Yimam. 2022. Irrigation and agricultural transformation in Ethiopia. IFPRI Project Note October 2022. Washington, DC: International Food Policy Research Institute (IFPRI). <https://doi.org/10.2499/p15738coll2.136461>.

Merga, Gemechis et al. 2023. “Welfare impact of improved maize varieties adoption among smallholder farmers in Amuru district of Horo Guduru Wollega, Ethiopia.” *Cogent Economics & Finance* 11:1, Dec 2023, p. 2207923.

Michel, M. 2018. Business Case for the Rural Land Administration Information Services. Land Investment for Transformation, Addis Ababa, Ethiopia.

Pacillo et al. 2021. “Is climate a ‘risk multiplier’ in Ethiopia?” CGIAR/World Food Programme study.

Porter, C., 2012. “Shocks, consumption and income diversification in rural Ethiopia.” *Journal of Development Studies*, 48(9), pp.1209–1222.

Schewel, K., and L.B. Asmamaw. 2021. “Migration and development in Ethiopia: Exploring the mechanisms behind an emerging mobility transition.” *Migration Studies*, Vol 9(4).

Seid, Edris and Ben Waltmann. 2023. “Why does Ethiopia collect so little tax?” Institute of Fiscal Studies Presentation to Ministry of Finance, FDRE, on May 30, 2023.

Solomon, D. et al. 2015. “Ethiopia’s Productive Safety Net Program (PSNP): Soil carbon and fertility impact assessment.” Cornell University.

Stevenson, E.G.J., et al. 2012. “Water insecurity in 3 dimensions: An anthropological perspective on water and women’s psychosocial distress in Ethiopia.” *Social Science & Medicine*, vol. 75, no. 2, July 2012, pp. 392–400.

SuDCA Development Consultants. 2019. PSNP Phase IV Public Works Impact Assessment, final report, Nov. 2019.

Tesfachew, T. 2022. "Ethiopia's drive to advance digital transformation. South-South Integration and the SDGs: Enhancing Structural Transformation in Key Partner Countries of the Belt and Road Initiative." United Nations Conference on Trade and Development, ECIDC Project Paper PB 2.

UNICEF Ethiopia. 2023. "Learning and Development." New York: United Nations Children's Fund.

United Nations Office for the Coordination of Humanitarian Affairs (OCHA). 2022a. Ethiopia Gambella Region Flood Update.

United Nations Office for the Coordination of Humanitarian Affairs (OCHA). 2022b. Horn of Africa Drought Regional Humanitarian Overview and Call to Action.

United Nations Office for the Coordination of Humanitarian Affairs (OCHA). 2023. Ethiopia Situation Report.

United Nations World Tourism Organization. 2023. *Climate Change and Tourism*. Madrid: United Nations World Tourism Organization.

Woolf, D. et al. 2015. *Climate Change Mitigation Potential of Ethiopia's Productive Safety-Net Program (PSNP)*. A World Bank Climate-Smart Initiative (CSI) Report. Cornell University.

World Food Programme. 2023. "More than a Decade of Drought: Impacts and lessons learned across the Eastern Horn of Africa 2011–2022."

World Bank. 2017. *Climate Vulnerability Assessment: Making Fiji Climate Resilient*. Washington, DC: World Bank.

World Bank. 2019. *World: Measuring Rural Access Update 2017/18*. Washington, DC: World Bank.

World Bank. 2019a. *Unlocking Ethiopia's Urban Land and Housing Markets*, Synthesis Report. Washington, DC: World Bank.

World Bank. 2019b. *Climate Resilient Road Assets in Albania*. Washington, DC: World Bank.

World Bank. 2020a. *Development Indicators*. Washington, DC: World Bank.

World Bank. 2020b. *Ethiopia Poverty Assessment 2020*. Washington, DC: World Bank.

World Bank. 2021a. *Climate Risk Profile: Ethiopia*. Washington, DC: World Bank.

World Bank. 2022a. *Ethiopia's Great Transition: The Next Mile - A Country Economic Memorandum*. Ethiopia Country Economic Memorandum. Washington, DC: World Bank.

World Bank. 2022b. *Macro Poverty Outlook*. Washington, DC: World Bank.

World Bank. 2022c. *Voluntary Migration in Ethiopia*. Washington, DC: World Bank.

World Bank. 2022d. *Climate & Disaster Risk Finance (CDRF) Diagnostic Report*. Washington, DC: World Bank.

World Bank. 2022e. *Ethiopia Rural Income Diagnostics Study – Leveraging the Transformation in the Agri-Food System and Global Trade to Expand Rural Incomes*. Washington, DC: World Bank.

World Bank. 2022f. *State and Trends of Carbon Pricing 2022*. Washington, DC: World Bank.

World Bank. 2023a. *Ethiopia Monthly Economic Update – March 2023*. Washington, DC: World Bank.

World Bank. 2023b. *Macro Poverty Outlook for Ethiopia: April 2023*. Washington, DC: World Bank.

World Bank. 2023c. *Population Estimates and Projections*. Washington, DC: World Bank.

World Bank. 2023d. *On the Path to Industrialization: A Review of Industrial Parks in Ethiopia*. Washington, DC: World Bank.

World Bank. 2023e. *From Productive Safety Nets to Productive Jobs* (forthcoming). Washington, DC: World Bank.

World Bank. 2023f. *The State of Welfare of Pastoral Communities in Ethiopia* (forthcoming). Washington, DC: World Bank.

World Bank. 2023g. *Ethiopia Poverty Assessment 2024*. Washington, DC: World Bank.

World Bank Group/GFDRR. 2019. *Disaster Risk Profile: Ethiopia*. Washington, DC: World Bank.

World Bank Group/GFDRR. 2021. *Assessment of Economic Impacts from Disasters along Key Corridors*. Washington, DC: World Bank.

World Resources Institute. 2021. *Balancing Water Demands and Increasing Climate Resilience: Establishing a Baseline Water Risk Assessment Model in Ethiopia*. Washington, DC: World Resources Institute.

