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Financing Ethiopia's Green Transition

Ethiopia

Working Paper Series 5

Financing Ethiopia's Green Transition

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Note: The purpose of this Working Paper is to bring the analytic work of UNDP-Ethiopia and its partners to a broad audience, as a contribution to the policy agenda and debate in Ethiopia. It does not represent the official policy or views of the UNDP.

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ACRONYMS

AF	Adaptation Fund
AFD	French Development Bank
AfDB	African Development Bank
AFOLU	Agriculture, Forest, and Other Land Use
AMP	Africa Minigrids Programme
AREF	Africa Renewable Energy Fund
BAU	Business as Usual
CCDR	Country Climate and Development Report
CDM	Clean Development Mechanism
CIF	Climate Investment Funds
CPI	Climate Policy Initiative
C-PIMA	Climate Public Investment Management Assessment
CRGE	Climate Resilient Green Economy
CTF	Clean Technology Fund
DFID	Department for International Development
ECF	Extended Credit Facility
EEA	Ethiopian Energy Authority
EEP	Ethiopian Electric Power
EFCCC	Environment Forest and Climate Change Commission
EFD	Ethiopian Forestry Development
EIB	European Investment Bank
EPA	Environmental Protection Authority
GBP	Green Bond Principles
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GERD	Grand Ethiopian Renaissance Dam
GHGs	Greenhouse gases
GIZ	German Agency for International Cooperation
GoE	Government of Ethiopia
GW	Gigawatts
ICMA	International Climate Market Association
IEA	International Energy Associatio**n**
IFC	International Finance Corporation
IIED	International Institute for Environment and Development
IMF	International Monetary Fund
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
ISFL	Initiative for Sustainable Forest Landscapes
Kwh	kilowatt-hour
LDCF	Least Developed Countries Fund
LUCF	Land Use Change and Forestry
MDBs	Multilateral Development Banks
MoA	Ministry of Agriculture
MoF	Ministry of Finance
MoPD	Ministry of Planning and Development
MoWE	Ministry of Water and Energy
MW	Megawatts
NAP	National Adaptation Plan

NCQG	New collective quantified goal on climate finance
NDC	Nationally Determined Contribution
NEP	National Electrification Programme
NFSDP	National Forestry Development Plan
NGO	Non-governmental organization
OECD	Organization for Economic Cooperation and Development
PPP	Public-Private Partnership
PSNP	Productive Safety Net Programme
REF	Rural Electrification Fund
REI4P	Renewable Energy Independent Power Producers Procurement Programme
RST	Resilience and Sustainability Trust
SCCF	Special Climate Change Fund
SCF	Strategic Climate Fund
SDGs	Sustainable Development Goals
SEFA	Sustainable Energy Fund for Africa
SLMP	Sustainable Land Management Programme
STAR	System for Transparent Allocation of Resources
TWh	Terawatt hour
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VCM	Voluntary Carbon Market
VFMI	Vision Fund Microfinance Institution
WB	World Bank
WEF	World Economic Forum

Ethiopia is navigating complex challenges in the areas of green finance and green energy. Like all countries, Ethiopia has been adversely impacted by the global climate crisis, which is jeopardizing its development path. In 2022, the country ranked 155 out of 187 countries in the global index for climate vulnerability.[1] Coupled with rapid population growth, deforestation, and soil degradation, the country's environmental sustainability and socio-economic progress have been impacted with pronounced negative effects on GDP and welfare. Ethiopia has been active in mobilizing finance to address some of these shocks.

As the world tries to decarbonize in the presence of strong climate change and extreme weather events, there was a major summit at COP29 in Baku, Azerbaijan in November 2024. Under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC), a deal was reached to triple finance from the developed world to the developing countries, from the previous goal of US$100 billion annually, to $300 billion annually by 2035. The new collective quantified goal (NCQG) on climate finance is the new international benchmark. The deal also sees contributions from China, other emerging markets, and the private sector on a voluntary basis. There was a breakthrough on carbon markets with parties reaching agreement on standards for the creation and trading of carbon credits and the associated supervisory standards. This operationalization of the market-based cooperative implementation of the Paris Agreement (Articles 6.2 and 6.4) was another major outcome. Some progress was made both in terms of the Loss and Damage Fund and Adaptation Fund.

The existing climate finance landscape for many African countries is complex but promising. A recent UNDP study finds that Africa is receiving only 11 percent of the required amount to implement the Nationally Determined Contributions (NDCs) leaving an immense gap of $2.5 trillion (given that African governments have committed to mobilizing around 10 percent of their need domestically). Of the total tracked finance flow to Africa between 2011-2021, $71.1 billion for adaptation, $74.8 billion for mitigation, and $24.6 billion for crosscutting activities. From 2011 to 2021, East Africa mobilized close to $44 billion in climate finance, with Ethiopia among the top five African countries that obtained the highest climate finance.[2]

Ethiopia has been relatively successful in mobilizing green finance for many of its projects. Over the years, there have been many successful policies and projects related to energy production, deployment, and electrification, with focus on hydropower, solar and wind energy resources. The country has succeeded in mobilizing approximately $400 million in terms of grants from multilateral vertical funds including Global Environment Facility (GEF), Green Climate Fund (GCF) and Adaptation Fund (AF) in the last decade. The Grand Ethiopian Renaissance Dam (GERD) financing has been successful.

The Government of Ethiopia has made progress on many fronts in terms of climate strategy. The Climate Resilient Green Economy (CRGE) was adopted in 2011, which is co-chaired by the Ministry of Finance and, the Ministry of Planning and Development. Prime Minister Abiy Ahmed championed the Green Legacy Initiative (GLI) launched in 2019. The National Adaptation Plan (NAP) was set up in 2019, and there has been the articulation of sectoral climate resilient strategies. The Government has historically focused more on **adaptation**, but per the 2021 NDC, more than 80 percent of finance will be intended for **mitigation**.

The country has been **successful in several elements of green policy.** First, from 2011, a sizable proportion of adaptation activities took place in the agriculture sector, focused on soil, water conservation and crops, as well as in resource development for hydropower and irrigation sectors.

1 Climate vulnerability index measures country exposure, sensitivity, and ability to adapt the negative impact of climate changes. https://gain.nd.edu/our-work/country-index/rankings/

2 UNDP (2024)

These included large flagship resilience projects such as the Productive Safety Net Programme (PSNP), the Sustainable Land Management Programme (SLMP), the ONE-Wash Programme, and the GLI. Likewise, large-scale REDD+ interventions are implemented across the country that contribute to adaptation, even as they are predominantly designed to have mitigation impacts by reducing emissions from deforestation and enhancing carbon sequestration.

However, there remains **a significant gap between country needs and resources mobilized**. An assessment of the existing financing sources and their contributions to the climate related investment (adaptation and mitigation activities) by Government of Ethiopia reveals that the NDC has a financing gap of approximately $197.94 billion which is equivalent to $19.7 billion annually. This study identifies **seven key constraints** to green financing in Ethiopia:

First, since 2020, **there have been macroeconomic challenges as the country has faced a succession of and overlapping economic shocks** – the COVID pandemic, the internal conflicts, the Southeastern Ethiopia drought, the Ukraine and Gaza crises. These have undermined macroeconomic stability and contributed to **a decline in global funding for development, while leading to** a weakening fiscal and current account position, rising inflation, and shifting the focus to humanitarian concerns. The recent IMF Programme of $3.4 billion signed in July 2024 and the **transformative economic reforms** by the Government of Ethiopia are a strong positive move. Despite successful work under the GLI and ambitious work in the forestry sector, the quest for green financing is still in an early stage. Despite NDC commitments, Ethiopia has been partially off-track in terms of the Sustainable Development Goals (SDGs) related to energy.

Second, **there has been a challenging policy environment in terms of renewables**. Ethiopia is one of the few African countries whose electricity generation comes almost entirely from renewable sources.[3] Although a detailed energy strategy is in place, the policy environment and its implementation have been challenging for distinct reasons, including policy inconsistency. The low electricity tariffs make it challenging for the private sector to invest in the energy sector. There is an inadequate policy framework for imports of solar panels and wind turbines. Many renewable projects have **started and stopped**, either because of forex challenges, regulatory issues, or security considerations.

Third, there are still significant **microeconomic costs of renewables**. Several factors impact the cost of renewables. First, due to the intermittent nature of renewables, grid investment, especially for wind and solar, translates to upfront capital costs. The cost of turbines and panels has been declining, but there are other significant costs, especially costs of battery, storage, and transmission. Second, expensive logistics via Djibouti add to the costs of importing heavy equipment, especially wind turbines. Third, there are complex land acquisition issues, especially for wind and solar projects. Finally, there is room for more collaboration between regional and federal governments in terms of renewable energy projects.

Fourth, **there is no clear pipeline of bankable projects with identified feasibility studies**. This reduces the capacity to mobilize resources for climate-compatible development. While there are many projects that have been identified at the Ministry of Finance (MoF), Ministry of Planning and Development (MoPD), and line ministries, many of those projects lack rigorous feasibility studies. Assessments of socio-economic impact and community impact have also been lacking in many cases. Data on climate change impact has been scant. There are clear priorities that can be assessed and expanded (Table 1).

Fifth, **despite government leadership, institutional fragmentation and capacity constraints remain issues.** While much progress has been made, as in many other African countries, there is insufficient coordination across sectors and institutions, lack of climate finance data, and inadequate systems

3 Hailu (2017)

to meet minimum standards of climate finance funds. Also lacking is a unified perspective across ministries and government agencies. The MoF, MoPD, Ministry of Water and Energy (MoWE), and line ministries, especially the Environmental Protection Authority (EPA) and the Ministry of Agriculture (MoA), have overlapping divisions of roles and responsibilities in the overall green economy/ energy space. The PPP team at the MOF, the experts at MOPD, and the technical team at EEP have not worked in collaboration; therefore, fragmentation across ministries prevails.

Sixth, while it has the political commitment and ministerial leadership, Ethiopia lacks the full **expertise and administrative capacity** to navigate the climate/green finance accessing processes and procedures of bilateral and multilateral funds. Ethiopia currently lacks institutional and legal expertise in terms of climate finance planning, implementing, and reporting. Climate finance often requires comprehensive documentation. Moreover, there is insufficient awareness of green bonds, carbon credits and blended finance modalities at the government level, compared to countries like Ghana, Kenya, and South Africa.

Finally, there is **limited private sector engagement in energy generation**. Private climate finance has been limited. Despite attempts made, there has been a longstanding challenge in pursuing successful public-private partnerships in energy generation. The existing system has relied on state actors. The international and domestic private sectors will be key players in the energy transition. They should be brought on board, especially in the design and operationalization of PPP contracts and initiatives.

Way Forward

Ethiopia will have to find the way forward on climate finance. Table 1 provides a framework for Government to move forward. There are seven steps in the roadmap.

- Ethiopia's **energy mix** can continue to rely on hydropower as a baseload source of energy, with solar (to a large degree) and wind and geothermal (to a lesser degree) as intermittent sources (Annex Table 4 shows a pipeline of projects).
- Ethiopia should articulate a **policy framework** for climate finance, with key focus on expanding concessional vertical funds, multilateral, bilateral, and private funding, and link these to priority national projects. Government should continue its successful strategy of securing concessional and non-concessional finance from bilateral sources for hydropower generation.
- It is important for Ethiopia to work on the **trifecta of green bonds, carbon credits, and debt swaps** as they can bring in additional finance for renewables. More than $2 billion can be mobilized by 2030. Germany, Italy, Sweden, and Denmark could be potential countries for swaps.
- Respective line ministries create a **pipeline of bankable projects** with feasibility studies.
- It is key to strengthen the **public-private partnership (PPP)** efforts to support the renewables sector and raise capital for investment. **Transactions advisers** can support the process.
- A **regular consultative forum** between the public sector and private investors is key.
- Government can strengthen the **CRGE forum** jointly chaired by MOF and MoPD that issues a policy paper, helps coordinate stakeholders, tracks climate finance, and advises government on financing strategies and bankable projects.

Table 1: Energy Roadmap Matrix for Government of Ethiopia

Activity	Short-Term (2024-2025)	Medium and Long-Term	Agency Involved
Advocacy and Partnerships	> Draft strategic note on the promotion of renewables (South Africa, Kenya) with focus on hydro (baseload) and solar and wind (intermittent); focus on strategic goals, institutional arrangements, governance, KPIs, costs and resources > Work with UNDP on forum to bring private solar and wind investors, government officials, private sector, development partners, and regional governments > GOE strengthen CRGE Forum (MOF, MOP, NBE, EEP, line ministries)	> Implementation of plan > Allocation of resources to bankable and prioritized renewable projects ensuring cost effectiveness of investments > CRGE monitors climate finance annual disbursements and allocations with Annual Reports > Continue regional power trading with neighbours	MoPD MoF MoWE EEP UNDP Multilaterals Bilaterals
Policy	> Define a national policy framework to support renewable sector (production and investment incentives, licensing, subsidies, fiscal exemptions) > Refine PPP policy regime and IPP legislation	> Implementation of legislation governing IPP projects > Develop PPP projects with support of Transactions Adviser > Training Programmes for renewables for stakeholders	MoPD MoF EEP NBE
GEF/GCF	> Work closely with multilateral vertical funds to issue proposals and lobby for changes in allocation formula > Strengthen monitoring/ evaluation systems	> Strengthen the portfolio of GEF/GCF projects > Faster disbursing projects with solid ESG analytics	MoPD MoF UNDP
Multilateral and bilaterals	> Establish an inventory of concessional finance available from MDB's (including IDA), new Development Banks, China, and other leading bilaterals) > Obtain funding for key feasibility studies	> Implementation of pipeline of renewable projects financed by multilaterals/bilaterals and using concessional and blended finance instruments	MoF MoPD EEP WBG, AFDB, UNDP
Green bond	> Identify a pipeline of eligible projects > Identify potential issuers of green bonds > Work with UNDP team to set up Govt team and devise bond structuring arrangements and principles	> Issuance of green bonds by financial institutions, municipalities, and sovereign > Allocation of proceeds > Identification of tracking	MoPD MoF DBE UNDP

Activity	Short-Term (2024-2025)	Medium and Long-Term	Agency Involved
Carbon credits	> Articulate carbon market strategy and work with carbon credit experts > Adopt framework to ensure carbon credit benefits remain with local communities and has positive environmental and social outcomes	> Implementation of structured approach to trading of carbon credits > Develop a system with improved integrity in voluntary carbon markets	MoF MoPD UNDP Regional governments
Debt management/ debt swaps	> Work closely on non-concessional and concessional borrowing for hydro > Identify bilaterals for debt swaps and conduct discussions	> Debt swap for investments in climate projects working closely with willing bilaterals > Robust M and E system	MoF Line ministries
Innovative	> Two percent wealth tax on billionaires (Brazil G20 proposal) > Nominal surcharge from Ethiopia airline > Diaspora bonds; voluntary donations	> Use of innovative funding for micro projects, including solar minigrids, resilience, and adaption in rural communities	MoF MoPD EEP

Africa, like the rest of the globe, is being strongly impacted by the global climate crisis, which is jeopardizing its development path. Climate change represents an existential threat to the planet. From Panama to Pakistan, from the Maldives to the Arctic, no part of the globe has been immune to climate change. The rising sea levels and temperatures are impacting the planet. Compared to other regions of the world, a faster increase in temperature is observed in Africa leading to above average sea level rise, and frequent and intense extreme events. According to a recent study by the United Nations Development Programmeme (UNDP),[4] the economic impact will be exacerbated by Africa's low climate adaptive capacity and the vulnerability of major sectors. Another study finds that, globally, damage from climate change to farming, infrastructure, productivity, and health will cost an estimated $38 trillion per year by 2050, along with a 19 percent reduction of income. [5] Most of Africa's population makes a living in natural resource-based and climate sensitive sectors like agriculture.

Ethiopia is no exception to this Africa trend. While not a major emitter,[6] it has been adversely impacted by climate dynamics. Coupled with rapid population growth, deforestation, and soil degradation, the country's environmental sustainability and socio-economic progress have been adversely impacted. For Ethiopia, following the conventional development path would result in a sharp increase in greenhouse gas (GHG) emissions. There are clear patterns substantiated by empirical literature and practical observations.

> **Negative impact on Gross Domestic Product (GDP) and welfare**. A recent Country Climate and Development Report by the World Bank notes that if current policies are maintained, average annual losses to GDP range from 1 to 1.5 percent between 2024 and 2030. The cumulative economic losses are projected to increase from 10 to 14 percent of the GDP between 2023 and 2030. In the following decade (2030 to 2040), the economic loss is estimated to rise to approximately 20 to 30 percent of the average decadal GDP. [7] These will translate into welfare losses for a population that is, in large part, living in agriculture.

> **Negative impact on hydropower.** Climate change is adversely affecting Ethiopia's water resources.[8] The impact of climate change on stream flow in Ethiopia includes a reduction in water availability, and an increase in the frequency and intensity of extreme weather events such as floods and droughts, which results in irregularities in hydropower generation. The highlands are more likely to experience intense and erratic rainfall, while the lowlands will experience increased temperatures and pronounced droughts.

> **Increased droughts.** The country has experienced 10 droughts since 1980, and evidence shows an increased frequency of droughts in frequency and intensity. Around 11 million people faced food insecurity due to frequent droughts between 2020 and 2023. Projections show that by 2040 the number of people facing water scarcity will increase by 35 percent. In 2021, Ethiopia's Somali region continued to be the epicenter of a three-season drought that has struck the eastern Horn of Africa; the region also faced flash floods this year, which were equally devastating.[9]

4 UNDP (2024)
5 Kotz et al (2024)
6 Ethiopia, like other sub-Saharan African countries, is a marginal producer of emissions, accounting for less than 0.53 percent of total global emissions according UNFCCC reports.
7 World Bank (2024)
8 Getahun et al. (2020)
9 Giovetti (2022)

The objective of this working paper is to identify the potential sources of finance for Ethiopia's green energy transition. The study asks several key questions.

- First, in the wake of growing climate change impact, the report examines the developments in the international climate architecture since the COP29 summit in Baku, in November 2024, and the potential impact on Ethiopia. As the international climate finance space has been on the top of the global agenda, there have been many shifts and developments in the architecture for financing the climate transition. The study focuses on developed country commitments for climate finance, loss and damage, adaptation funds, and carbon credits.
- Second, it describes the Ethiopian government role in the global climate agenda, its domestic policy framework for green energy, and the integration of climate resilience into national development strategies, with focus on policies that promote renewable energy and sustainable agriculture. It examines the signature Government Programmes, especially the Green Legacy and ambitious reforestation efforts.
- Third, it reviews the status of renewable energy utilization in the country and assesses the estimated potential of the country from each energy source, such as hydropower, solar, wind, and geothermal resources, to meet domestic energy needs and drive economic growth. Since Ethiopia has a dense network of rivers, solar potential in the highlands, geothermal resources, and wind energy in flatter areas, these can provide a basis for greater investments in renewables. The study uses a case study based on field visit to South Africa.
- Fourth, it looks at Ethiopia's track record in terms of mobilization of climate finance for both climate mitigation and adaptation. As Ethiopia has attracted significantly more climate finance for adaptation than mitigation projects, the study will survey the patterns and way forward in these two areas.
- Fifth, it assesses the capacity of government to present strong bankable projects and cohesive proposals to international donors and financial institutions and assesses the mechanisms to monitor and report on impact of funded projects. It also looks at the capacity of Ethiopia to meet stringent requirements of international financial institutions and climate funds.
- Sixth, the study seeks to find a path forward for the government to navigate the global financing landscape and obtain financing. This working paper seeks to examine the opportunities for scaling up climate/green finance. It surveys the existing climate finance landscape including multilateral vertical funds (GEF, GCF, AF), multilateral institution, bilateral donors, and innovative and non-traditional instruments (green bonds, carbon credits, and debt swaps). It looks at the possibility of private sector involvement in adaptation and mitigation and suggests the best path forward.
- Seventh, it identifies requirements and prerequisites for Ethiopia to access this funding, which include reforms in project preparation; regulatory, environmental, and monitoring reforms; PPP development, and third-party verification both of carbon credits and green bond use. The study also examines what government can do in terms of regulations, policies, and incentives to attract foreign investors in the renewables sector.

Ethiopia is a country with a clear strategy to climate action. At the recent COP29 summit in Baku, Ethiopia, like some other developing countries, articulated a strong vision based on four action areas: a push for a high envelope of a New Collective Quantified Goal (NCQG) for climate finance to support developing countries; operationalization of the Loss and Damage Fund; capitalization of the adaptation fund; development of carbon markets. The areas where COP29 made progress were in the areas of climate finance and carbon markets. Many experts have deemed COP29 the first ever "Finance COP," where the developed countries agreed to mobilize $300 billion of climate finance (including both public and private sources) annually by 2035 for the developing world. Although the amount was significantly less than the $1 trillion asked by the developing countries —especially the small islands— it was at least an improvement over the status quo.[10] In a significant breakthrough, COP29 represented a step forward in the operationalization of carbon markets by establishing a clear global architecture with functional carbon markets.[11] There was some forward momentum on both the adaptation fund and the loss and damage efforts.

Ethiopia is a signatory of the Paris Agreement and has been regularly updating its NDCs, including for February 2025 in advance of COP30 in Brazil. Globally, the Paris Agreement was an initiative to limit the rise in global average temperature to below 2 degrees Celsius from the pre-industrial levels. As part of its commitment, Ethiopia submitted an updated NDC to the UNFCCC in 2021. Ethiopia is committed to reducing emissions by 68.8 percent by 2030.[12] It has a Long-Term Low Emission Development Strategy and National Adaptation Plan to address climate change. [13]

The stylized facts regarding Ethiopia's emissions paint a challenging picture.

> Ethiopia's greenhouse gas emissions have increased along with economic growth. The total national emissions in 1994 were 108,333 Gg of CO2e; in 2018, they increased to 368,835 Gg of CO2e, indicating a 240 percent increase (Figure 1). By 2025, upon present trends, they can reach 425,000 Gg of CO2e based on Business as Usual (BAU).

> The Agriculture, Forest, and Other Land Use (AFOLU) sector is responsible for a large amount of these emissions (see Table 2). For example, according to 2020 data, AFOLU contributed 92 percent, distantly followed by energy (4 percent), waste (3 percent), and industry (1 percent).

Historically, the Paris Agreement produced a long-term low-emissions strategy to implement the target. The updated NDC provides a clear demarcation between the effort (both in terms of mitigation and adaptation) that Ethiopia will pursue unconditionally (using domestic finance) and conditionally (based on international support). Of the total cost of NDC implementation ($316 billion estimated between 2020 and 2030), 20 percent will be domestically financed, and the remaining 80 percent will require international support.

10 There was no agreement on fossil fuel phaseout and significant divergences of view between developed and emerging markets, including UAE, Saudi, Qatar, and

11 Article 6.2 specifies how countries will authorize carbon credit transactions and manage tracking registries while Article 6.4 moves towards creating a centralized carbon crediting mechanism (Article 6.4), the Paris Agreement Crediting Mechanism now includes mandatory safeguards to protect the environment and human rights. These safeguards ensure projects cannot proceed without the informed consent of Indigenous Peoples.

12 FDRE (2021)

13 Ethiopia became one of first global countries to ban import of automobiles using fossil fuels.

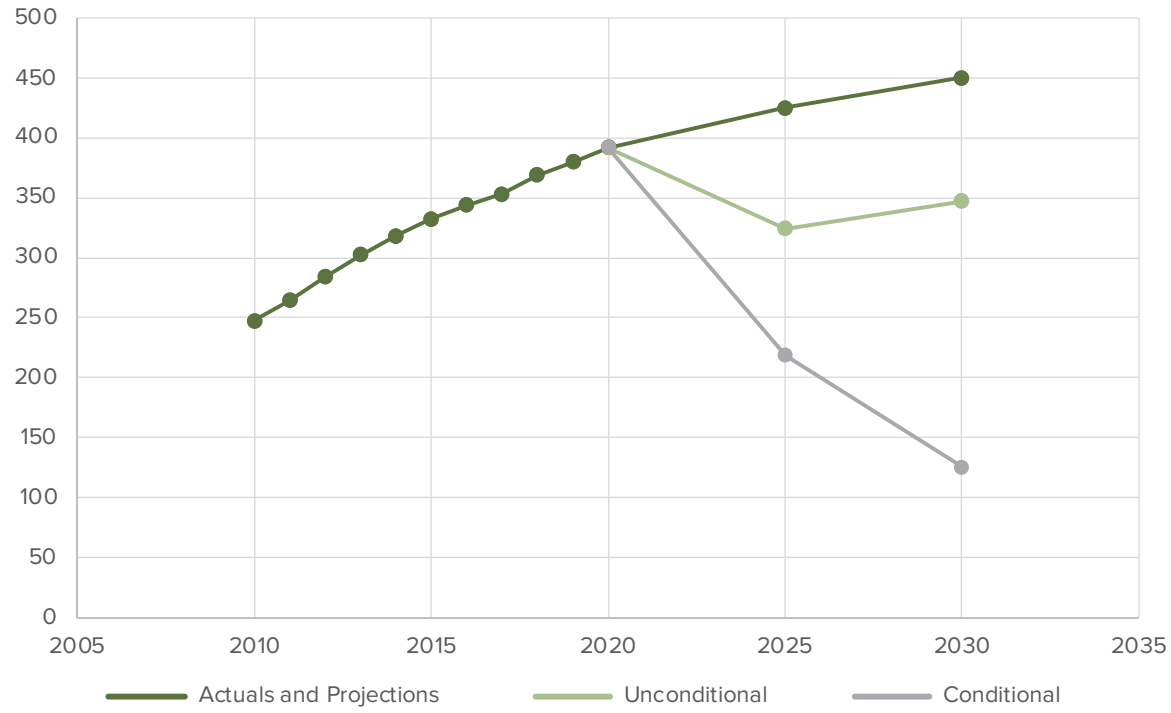
Table 2: Sectoral and Annual Emissions (Mt Co_2e) 2000-2020

Sectors	2000		2005		2010		2015		2020	
	Mt Co_2e	%	Mt Co_2e	%	Mt Co_2e	%	Mt Co_2e	%	Mt Co_2e	%
Energy	4	2	4	2	5	2	8	3	11	4
Land	75	47	103	51	116	48	112	42	122	41
Agriculture	76	48	89	44	116	48	134	52	152	51
Industry	0	0	1	0	1	0	3	1	4	1
Waste	4	3	5	3	5	2	7	2	9	3
Total	159	100	202	100	243	100	264	100	298	100

Source: MoPD (2023)

Renewable energy development is among the key investment areas in meeting Ethiopia's NDC targets. The energy sector possesses the third highest mitigation potential (following Land and Use Change and Forestry [LUCF], and livestock). Policy interventions that are planned to achieve the sector's mitigation target mainly focus on shifting energy use in the transport and industrial sectors from fossil fuel to electricity. Realizing these targets will require huge investment in renewable energy generation and transmission. Investment in renewable energy will also have indirect contribution to emission reduction from LUCF, which accounts emissions from household biomass energy use.[14] In addition, expanding electricity generation from renewable sources of energy is one the four pillars of Ethiopia's green economy plan and accounts the largest mitigation finance needs.

Figure 1: CO2 emissions of Ethiopia (tons)



Source: Government of Ethiopia, UNDP calculations

Ethiopia has developed various policy initiatives to tackle energy access and climate change challenges. The Government of Ethiopia (GoE) is currently implementing the National Electrification Programme (NEP) with the goal of achieving universal electricity access by 2025, but the target is unlikely to be achieved this year. The plan aims to have 65 percent of electricity access coming from

14 In Ethiopia, emissions from the LUCF sector largely emanate from land conversion and biomass energy use.

grid solutions and 35 percent from off-grid solutions.[15] Moreover, as one of the pioneers in Africa, a CRGE facility was established in 2011. A CRGE management committee comprising state ministers from the prioritized line ministries and key sectors and, co-chaired by the MoF and MoPD, was formed. The CRGE was the first of many initiatives to address climate change challenges at the policy level.[16]

The CRGE was ambitiously defined. The initiative which provides a blueprint to achieve middle-income status by 2030 without increasing greenhouse gas emissions relative to the 2010 levels. It follows a sectoral approach and has so far prioritized more than sixty initiatives. It is based on four pillars: 1) improving crop and livestock production practices for higher food security and farmer income while reducing emissions, 2) protecting and re-establishing forests for their economic and ecosystem services, including carbon stocks, 3) expanding electricity generation from renewables, and 4) leapfrogging to modern and energy-efficient technologies in transport, industrial sectors, and buildings. Three targets were identified: reduction of emissions by 68.8 percent by 2030; reforestation and restoration of up to fifteen million hectares; and 40 adaptation interventions across agriculture, water, forestry, transport, urban, and health sectors.

In terms of CRGE impact and SDG 7 progress, the record is mixed. Ethiopia is lagging in meeting its NDC under the Paris Agreement (Figure 1). Emissions in 2030 are highly unlikely to be at the 2010 levels, as stated in the CRGE strategy. According to the GoE, the proportion of population with access to electricity was 21.8 percent in 2015, and it has improved to 55 percent in 2023. Ethiopia is one of the few countries that generates almost all its modern electricity from renewable resources (92 percent from hydropower, 7 percent from wind power, and 1 percent from geothermal).[17]

However, the country has a large potential in energy development with some donor support. According to Ethiopian Electric Power (EEP), Ethiopia can generate over 60,000 MW of renewable energy, presenting a strong opportunity for the country's energy transition. In this context, the World Bank (WB), the African Development Bank (AfDB), the UNDP, and the French Development Bank (AFD) have been supporting the government's energy programme and the strengthening of the grid, while countries like China, Denmark, France, and Saudi Arabia have been supporting the renewable sector.

Ethiopia's national development plan and strategies have given a strong focus for the energy sector. The Growth and Transformation Plan II (GTPII) envisions that 15 to 20 percent of energy production will come from solar, wind, and geothermal due to uncertainty in relation to hydropower, which will still occupy the main position. Similarly, in the ten-year development plan (2021–2030), the energy sector is considered key to building a climate resilient green economy. The strategy plans to improve electricity and increase power generation capacity by 2030 to 19,900 MW and 7,184 MW, respectively (Figure 2a and b). The Home-Grown Economic Reform (HGER) has also put a precise plan to revise electricity tariff which was below cost recovery in the past.

Ethiopia has an ambition to become a regional power hub in East Africa. Operational power deals include 100 MW to Djibouti, 200 MW to Sudan and 200 to 400 MW to Kenya. There is also a plan to export 100 MW to South Sudan, 200 MW to Somalia and 200 MW to Tanzania. Revenue from electricity export has been on the increase. In 2024, Ethiopia received $139 million from regional power trade, accounting to about 3.7 percent of the annual export revenue. However, there are challenges to boost regional power trade for Ethiopia. These include, limited transmission infrastructure, lack of necessary regulatory frameworks and significant power loss due to geographic distance for some countries,

15 Ministry of Water, Irrigation and Electricity (MoWIE) (2017)

16 Other elements include the NAP, Sectoral Climate Resilient Strategy, Regional Adaptation Plans, NDC, and the Ten-Year Development Plan.

17 https://www.eep.com.et/?page_id=1033

political instability, high capital expenditure requirement.[18] Hence, enhancing regional trade require countries to harmonize their regulatory and operational frameworks, invest in power generation and transmission infrastructures, and mobilization of adequate financial resources.[19]

The government has taken various recent measures to enhance both public-private investment for renewable energy. These measures have focused on creating an enabling environment for potential investors, which include: updating the national energy policy and strategy, launching the power sector Reform Programme, establishing a regulatory and institutional framework for PPP; developing a financial risk mitigation strategy focusing on forex availability, convertibility and transferability (which is under development); and finally, having a climate smart transport policy by, for instance, incentivizing electric vehicle imports.

Figure 2a: Energy Development Plan

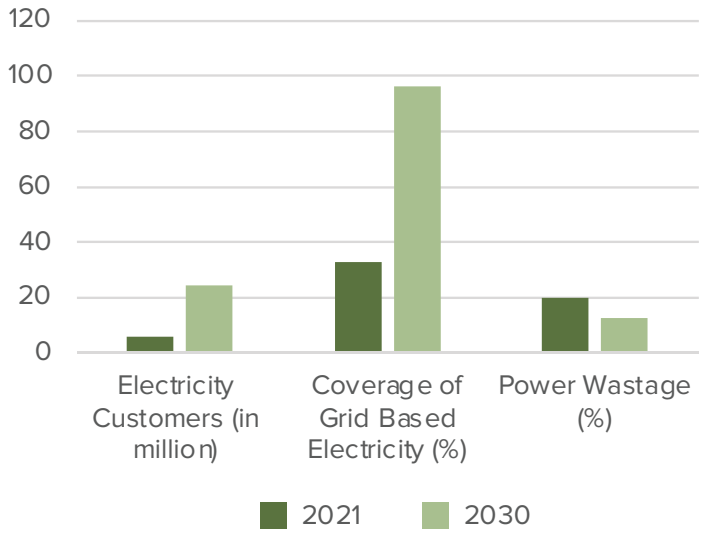
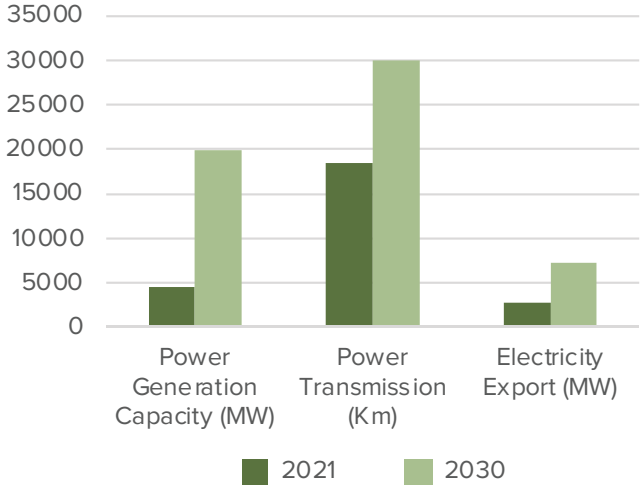


Figure 2b: Energy Development Plan



Source (figure 2a and 2b): Ten-Year Development Plan[20]

18 https://www.tralac.org/blog/article/16245-regional-electricity-market-under-the-afcfta-prospects-and-challenges-for-ethiopia.html
19 Ajagun, et al., 2024
20 Planning and Development Commission (2020)

Ethiopia has a few dedicated agencies working in the green and renewable space. A multiplicity of agencies and bodies are involved. The Ministry of Planning and Development provides the overall planning perspective for the country and articulates the broad vision for the country. The MOF coordinates the financing of projects and activities in the energy sector, while the MoWE plans and monitors overall energy development. The EEP is the entity responsible for generation and transmission, as well as provision of bulk electricity to the country. It is also mandated with exports to neighboring countries. The Ministry of Agriculture oversees projects at the local level, while Ethiopia Forest Development handles forest and conservation issues. The EPA manages environmental issues and standards. The Ethiopian Energy Authority (EEA) is envisaged as a regulatory agency for the energy sector. The Rural Electrification Fund (REF) supports private and cooperative engagement in the rural sector, working on off-grid solutions.

However, despite significant improvement in recent years, the system is characterized by fragmentation, lack of coordination, and overlapping mandates. Climate change, environment, and energy actors in Ethiopia are fragmented and scattered across these multiple ministries and agencies. Coordination between MoF and MoPD on climate finance is limited as the institutions have separate mandates. The PPP Unit at the MOF is not closely coordinated with the technical teams at the Ministry of Planning. The line ministries frequently prepare their own projects but not in a concerted fashion with central agencies. The precise communication flows between EEP and other agencies is unclear. While there are strong efforts, there is no central agency coordinating climate activities, as the National Treasury in Kenya, which plays a leading role in coordinating climate finance (Box 1).

Moreover, Ethiopia suffers from inadequate institutional capacity to manage green energy and mobilize climate finance. Institutional capacity has been a barrier to access climate finance for African countries. There are many dimensions to this. A combination of lack of climate finance data, skills gap in understanding and negotiating renewable projects, and lack of adequate monitoring and evaluation systems to meet standards of climate finance funds have all led to slow speed of project execution. A related issue is lack of technical capacity to develop a pipeline of viable climate projects. Projects are sometimes presented without strong feasibility studies. In a review of the renewable energy sector, [21] several authors note the lack of human capacity, including skilled workforce for the maintenance of energy generation technologies and limited knowledge in terms of the energy sector.

Finally, Ethiopia has a nascent Public-Private Partnership (PPP) framework impacting the structuring of critical renewable projects since 2018. Ethiopia has a history of state-owned enterprises, and the PPP ecosystem is not well developed. A trust deficit between the public and private sectors has been partly responsible for the low levels of private sector in the renewable space. It has been difficult to bring in private sector investment, partly due to forex challenges, partly to lack of regulatory environment, partly to lack of simple funding procedures and requirements. Projects in geothermal, solar, and wind energy have had a "stop and go" path, with lengthy negotiations, changing goalposts, and failed projects. Many Independent Power Producers (IPPs) in Africa are financed through financial institutions, export agencies, and donor grants.

A recent study identified several factors that hinder the success of PPP/IPP renewable energy developments in Ethiopia.[22] First, targets have not been realistic because an ambitiously high number and size of IPP projects have been planned without the required institutional and technical capacity for project finance and implementation. Before planning brand new projects, priority has not been given to implementing those that are in the pipeline. Second, tensions and fragmentations within the governance structure are present with lack of meritocracy and persistence of overlapping mandates

21 Tiruye et al (2021)
22 Ayele et al. (2024)

across different bodies, including EEP, MOF, and MOPD. Third, there has not been sufficient internal capacity (institutional and human) in transacting IPP projects. Finally, adequate policy support has not been given to the domestic private sector. Box 1 provides an example from Kenya of the institutional structure to support green finance.

Box 1: The Kenyan Experience and Institutional Structure

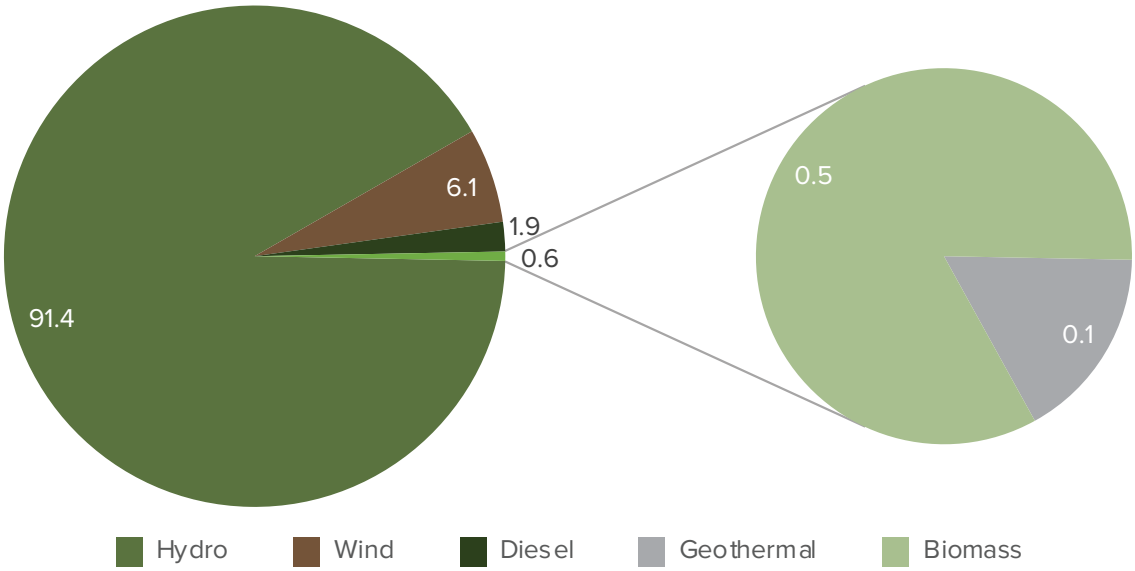
Kenya has been one of the pioneers of green finance in Africa. It has developed a key set of institutions to support its energy transition. It issued its first green bond in 2019, raising $40 million. Since then, green bonds have been promoted to finance environmentally friendly projects. The country has benefited from international climate finance sources such as the GCF, GEF and other multilateral funds for climate adaptation and mitigation projects. In 2018, around $2.4 billion was allocated to projects related to climate, representing approximately one-third of the yearly funding needed to meet the country's climate objectives. Most of this financial support was aimed at mitigating climate change, focusing on renewable energy, while a smaller portion was dedicated to adaptation efforts. Important institutions for green finance include:

- **National Treasury and Planning**: This government body plays a significant role in coordinating climate finance and managing funds from domestic and foreign sources. It also works on climate budgeting and manages the **National Climate Change Fund**, designed to support mitigation and adaptation projects in line with Kenya's climate action goals.
- **Kenya Climate Change Directorate**: Under the **Ministry of Environment and Forestry**, this directorate is responsible for **implementing climate policies and guiding** the country's climate finance agenda. It also ensures Kenya meets its obligations under international frameworks like the Paris Agreement**.**
- **National Environment Management Authority (NEMA)**: A key regulatory agency that ensures climate finance initiatives are in line with national environmental standards and supports the implementation of projects.
- **Kenya Climate Change Working Group (KCCWG)**: This group coordinates key stakeholders, supports policy advocacy, and mobilizes resources for climate action.
- **Central Bank of Kenya (CBK)**: The CBK has been instrumental in incorporating climate risk into Kenya's financial sector by guiding commercial banks on climate-related risk management.
- **Kenya Forest Service (KFS)**: KFS issues carbon credits, particularly through afforestation and reforestation projects. These projects often align with the Clean Development Mechanism (CDM) under the Kyoto Protocol and the voluntary carbon markets.
- **Kenya Electricity Generating Company (KenGen)**: As one of Kenya's largest electricity providers, KenGen has issued **green bonds** to finance renewable energy projects, particularly in the geothermal and hydropower sectors.
- **Commercial Banks**: Various banks, such as KCB Group and Co-operative Bank, have been active in the green bond market. KCB issues green bonds to support eco-friendly projects like renewable energy and sustainable agriculture.
- **Kenya Green Bond Programme**: Launched in 2017 by stakeholders including the Nairobi Securities Exchange (NSE), the Central Bank of Kenya (CBK), and private sector actors, this Programme facilitates the issuance of green bonds in Kenya. It provides guidance on how financial institutions can access the green bond market to finance low-carbon projects.
- **KCB Bank in Keny**a is also a financial intermediary for green finance in Kenya and East Africa. It has raised up to $250 million for climate finance.

One of the most promising areas for reducing emissions is the adoption of renewable energy. Throughout the world, renewable energy is on the ascent. Technological developments, especially in the West and China, have made renewable energy cheaper and easier to install. Given its large size and resource base, Ethiopia has ambitions to ensure energy security and access and reduce emissions from the energy sector. However, concrete implementation has lagged ambition.

The renewable sectors are promising. Ethiopia has abundant renewable energy resources and can generate over 60,000 MW of electric power from hydroelectric, wind, solar, and geothermal sources.[23] As of September 2024, EEP operates 16 hydropower plants and four wind farms. The current total installed capacity of electricity generation reached 5256.2 MW of which 91 percent (4820.2 MW) is generated by hydropower. Wind, geothermal and biomass contributed the remaining 7 percent (404 MW), 0.75 percent (7.3 MW) and 1 percent (25 MW), respectively.[24] Figure 3 shows the installed capacity, and Table 3 shows the potential by sector. The installed renewable energy generating capacity of the country was 2400 MW in 2015, which has increased to 5256.2 MW in 2023, indicating about a 15 percent increase per year.

Figure 3: Ethiopia Installed Power Capacity 2023 (percent)



Source: Ethiopian Electric Power

Table 3: Energy Resource Potential

Resource	Unit	Exploitable reserve	Exploited percent
Hydropower	MW	45000	<10
Solar	MW	28,209*	<1
Wind	MW	10000	<1
Geothermal	MW	10000	<1
Wood	million tons	1120	50
Agricultural waste	million tons	15-20	30
Biogas	Household	1-3 million	<1

Source: NEP[25] *Ea Energy Analysis

23 https://www.trade.gov/country-commercial-guides/ethiopia-energy
24 https://www.eep.com.et/?page_id=1033
25 MoWIE (2019)

A. Hydropower

Hydropower electric generation is dominant in Ethiopia. Hydropower is the most utilized type of renewable energy, producing more than 15 percent of the world's electricity in 2024. However, based on the International Energy Association (IEA) projection of renewables, hydro is expected to decline and reach 13.9 percent of total electricity generation in 2028.[26] According to the International Hydropower Association (2022), Africa's energy generation from hydropower was 146 TWh (146,000,000 MWh) in 2021, with 21 percent of this generation coming from Eastern African countries. The country is endowed with abundant water resources well distributed across the country. The completion of the GERD, with a projected installed capacity of 5,150 MW, is intended to serve as an engine for economic development and foreign currency earnings by exporting power to neighboring countries (Box 2). [27]

In Ethiopia, the National Energy Policy[28] places high priority on hydropower resource development indicating that hydrological resources are Ethiopia's most abundant and sustainable energy forms. Even if Ethiopia has a plan and an ardent desire to diversify the energy mix, hydropower will continue to be a major source of renewable energy to meet the country's current and future power demand. **Due to its competitive price, hydroelectricity is a viable renewable energy source.** Hydroelectric power generation projects are known to release much lower levels of carbon dioxide (CO2) emissions in comparison to facilities powered by fossil fuels, making them a cleaner form of energy production. Additionally, unlike fossil fuel-based facilities, hydroelectric projects do not produce any direct waste, making them a more environmentally friendly option. [29]

One challenge for hydropower in Ethiopia is the transboundary nature of rivers and the geopolitical tensions. Almost all rivers (except the Awash River) that drain in the twelve river basins of Ethiopia are transboundary in nature[30] [31]. Since 1991, Ethiopia constructed large hydro projects.[32] Despite these major developments that substantially increased the total power generation capacity of the country, geopolitical issues remain the salient feature of hydropower development. The Abbay (Blue Nile) basin, which accounts for the major hydropower potential of the country, exhibits the most contentious geopolitical setting. Abbay is a sub-basin of the Nile Basin and contributes the largest share of water to the Nile River. The Ethiopian government since the 1960s planned the construction of mega dams on the Abbay River. Downstream countries (mainly Egypt) oppose water infrastructure development in the Abbay basin stating that their historical water right and associated economic benefit will be compromised by such developments. As a result, the international financial institutions are hesitant to finance hydropower projects planned by Ethiopia.

26 https://www.iea.org/reports/renewables-2023/electricity. By 2028, potential renewable electricity generation is expected to reach 14 430 TWh, or 42 percent of global electricity generation, an increase of almost 70 percent from 2022.

27 The GERD has been a source of contention between Ethiopia, Egypt, and Sudan.

28 Ministry of Mines & Energy (1994)

29 http://junikhyatjournal.in/no_1_jan_20/70.pdf

30 Berhanu et al., (2014)

31 Four transboundary river basins, namely Abbay, the Baro-Akobo, the Omo-Gibe and the Tekeze account for 80 to 90 percent of the country's total water flow.

32 Including Tekeze, Gilgel Gibe I, Gibe II, Gibe III, Beles, Amerti Neshi and Genale Dawa III. GERD is under construction and partially operational (Box 2) where the construction of another mega dam, Koysha (Gibe IV) is halted due to shortage of funding after reaching 66 percent of completion.

Box 2: GERD

GERD is a hydropower-generating dam that is being built 700 km northwest of Addis Ababa in the Benishangul Gumuz region with an estimated cost of $5 billion. With its turbines, it will have an installed generation capacity of more than 5000 MW. When completed, it will be the largest dam in Africa and among the 20th largest in the world. It reached its fifth phase, which was completed in August 2024, bringing the water level to approximately 640 meters. However, with the inception of the project in April 2011, tensions among Egypt, Sudan, and Ethiopia have escalated, leading to international concerns.

There are disputes with neighbors, with an elusive quest for consensus. Egypt has claimed that it faces an existential threat since the Nile provides much of the water for Egyptian agriculture. It claims there should be a legally binding agreement before the start of the filling of the dam and has argued to keep the 1959 agreement between Egypt and Sudan, while Ethiopia and upstream countries rejected it. Ethiopia insists on its national sovereignty and energy needs. The fourth round of negotiation was conducted in December 2023, and the focus was to reach an agreement on the guidelines and rules for the filling and annual operation of the dam.[33] However, a definitive agreement has not yet been reached, even after multiple negotiations that have lasted more than a decade.

Climate change is an additional challenge facing Ethiopia's hydropower sector. First, rainfall variability, induced by climate change, is impacting runoffs to the dams leading to sub-optimal generation of power. In Ethiopia, since the 1970s, climate change has led to a decrease in rainfall and more intense and irregular rainfall, causing erosion that will impact the dams. Climate change projections for Ethiopia are consistent about the increment of temperature but make diverse predictions regarding changes in precipitation and runoff. Projections from different climate models show a wide range of changes in precipitation for Ethiopia, but they tend toward increases by 2030. High uncertainty in the direction and amount of anticipated change in precipitation are observed across models by the 2050s. There is also an indication for rising extreme weather events of both flooding and droughts.[34]

Simulation studies by the WB show that climate variability will increasingly affect hydropower generation, especially after 2030. According to the study, a reduction in water availability and river flow, threatens potential energy generation for Ethiopia. In addition, projected trends are expected to increase costs of maintenance and repairing of power and energy infrastructure as well as disrupt power supply. Increased heat is likely to threaten the cooling capacity of power generating stations with potential to impact generation as well as transmission. Two extreme events; namely drought and flooding, are additional threats to hydropower generation capacity.[35] Drought creates water shortage while flooding leads to high sediment loads in rivers, which can reduce reservoir volume. If reservoir volume is significantly reduced, it can ultimately lead to lower power generation capacity. The devastating impact of drought became evident in the past where, for example, the worst drought in the last 50 years, which occurred in 2015/2016, created turbine damage and made some of the hydropower generation plants in the country inoperable.[36]

There are other challenges. Hydropower projects may have external diseconomies affecting the ecosystems. Moreover, they require significant capital investment.[37] The recent experience with the Koysha Dam on the Omo River provides lessons. Despite its 1800 MW installed generation capacity,

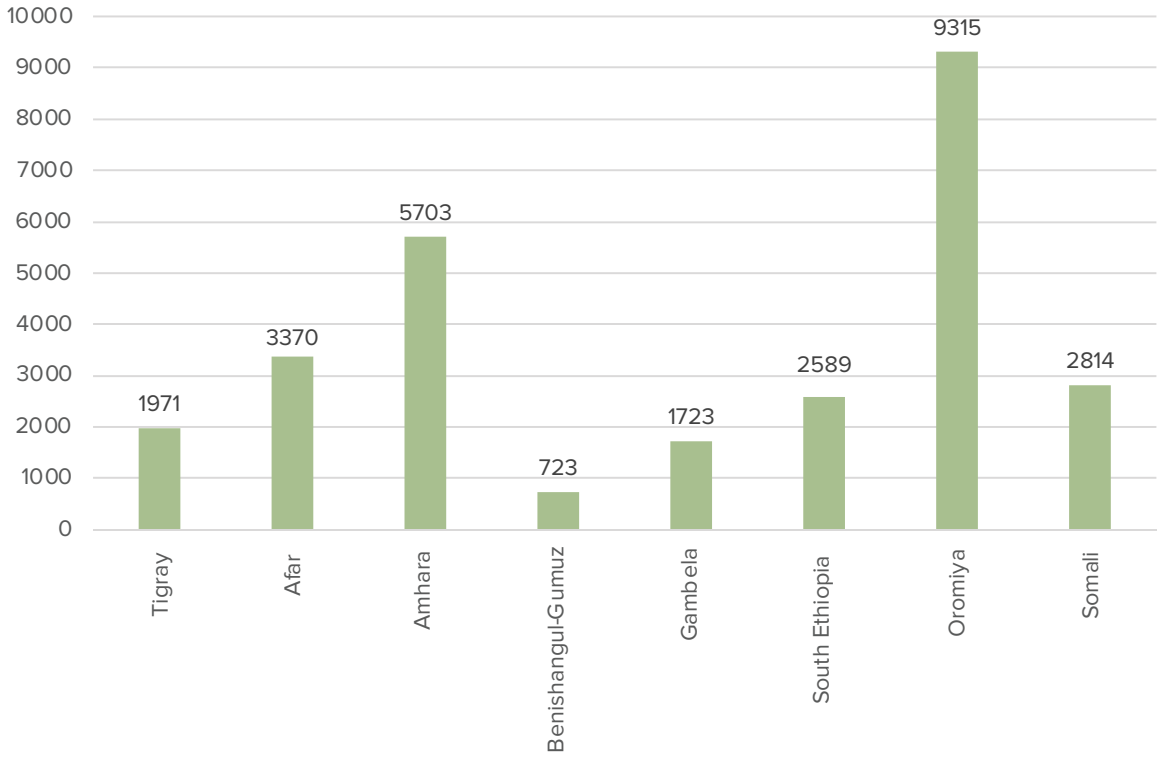
33 https://addisstandard.com/news-ethiopia-egypt-and-sudan-embark-on-fourth-round-of-gerd-negotiations-in-addis-abeba/
34 WB (2010); USAID (2015)
35 Danyo et al. (2017)
36 EEP (2017)
37 It will be a challenge to mobilize the required capex for Ethiopia in the environment of high borrowing costs.

this third-largest hydropower project had been delayed due to the lack of foreign exchange. It is difficult to predict conditions before dam construction starts, and unexpected costs and delays can occur, which makes it unattractive for private investors and lenders. Finally, the project approval process for hydropower projects takes a long time due to various prolonged social and environmental assessments.

B. Solar Energy

Solar energy is a renewable energy source and Ethiopia has considerable potential. According to a recent study by the firm Ea Energy Analysis, the country's annual average solar energy potential is estimated to be 28,209 MW.[38] Higher levels are observed in the Rift Valley regions and western and eastern lowlands (Figure 4). [39] Currently, only about 14 MW of solar photovoltaic (PV) energy have been used for telecom service, lighting, powering water pumps in rural areas, and water heating in major cities. Most of these off-grid power needs were met with PV projects funded by donors. However, it should be noted that there is no national on-grid connected solar power plant built except small-scale off-grid PV systems installed in the rural area in the mid-1980s.

Figure 4: Solar Potential in Ethiopia by Region in MW



Source: Ea Energy Analysis

Ethiopia has made several attempts to develop large-scale solar power. In 2017, Ethiopia awarded Enel Green Power to build a 100 MW generating solar plant near Metehara, 200 km from Addis.[40] Ethiopia also joined the Scaling Solar initiative, which was established in 2015 by the WB's private wing, International Finance Corporation (IFC), to develop 250 MW and 750 MW solar power projects in two phases under PPP modality. In the first phase, two solar power projects (GAD and Dicheto)

38 Ea Energy Analysis
39 Hailu and Kumsa (2021)
40 https://www.enelgreenpower.com/countries/africa/ethiopia

each with a capacity of 125 MW were announced for tender and the Saudi company ACWA won the bid. In the second phase, a tender was issued for six projects, namely Weranso, Welenchiti, Humera, Mekele, Metema/Bahir Dar and Hurso with a total capacity of 750 MW. The tender was issued in 2019 but since then no winner has been announced. In 2021, the Masdar Ethiopia Solar PV Park project was incepted, and an agreement was signed in 2023 between GoE and UAE. The Masdar project planned to develop 500 MW of solar power, but exact sites have not been identified yet.

Despite Ethiopia's continues effort to develop large-scale solar power, so far the success rate is particularly low. Enel Green's project at Metehara is not operational to date, although it was expected to start operation in 2019. ACWA's contract for GAD and Dicheto is terminated because the company failed to deliver the project on time. The other six projects under the Scaling Solar initiative did not materialize. Beyond the signed agreement, no activity has started on the ground under the Masdar project.

A range of factors contributed to the low success rate; some factors are of a general nature while others are project specific. In the case of ACWA, for example, the COVID-19 pandemic, the northern war in Ethiopia, and the company's failure to secure funding from international lenders were the main reasons for the delay of the project, which ultimately resulted in termination of the contract.[41] The northern war was like wise a contributing factor in the lack of success of the additional six solar projects because most of them were planned in war-affected regions of Tigray and Afar. In addition to these specific issues, however, there are hindering factors that are common in most of Africa. These include high cost (due to high investment risk and cost of imported materials), low purchasing power of residents (and hence low tariffs), financially weak or insolvent national utilities (that are often the buyers in IPP deals) and high interest rate, all of which discourage private sector investment. [42]

Though promising, market-based private sector investment alone will not be adequate to expand solar power in Ethiopia. Subsidies and climate finance are important to bring down the costs of solar power thereby extending access to clean energy to poor people. The story of the Scaling Solar initiative, which pledged to realize the development of large-scale solar power quickly and profitability is worth mentioning here. IFC claimed that economically viable large-scale solar development could be achieved in Africa by following some simple steps. The initiative however did not 'scale up' and promoted private sector investment as expected. The implicit subsides that were provided under the pilot project in Zambia, which were against the initiatives 'no subsidy' motto, make it hard to effectively replicate it in other countries. [43]

Minigrids are one of the two off-grid solutions that are promising in achieving Ethiopia's national electrification goal. Minigrids are important systems to provide electricity to areas that are isolated or far from the central grid. According to the UNDP, the minigrid opportunity is centered around falling hardware costs (solar modules, batteries, energy efficient appliances), disruptive digital trends (mobile money, digital platforms and data), and innovative private sector business models. [44] The NEP of Ethiopia states that minigrids and individual solar systems will be used to deliver electricity to communities that cannot be connected to the main grid in the short-term and in the long-term. Until 2019, off-grid Programmes have provided access to over two million beneficiaries.[45] Ethiopia obtained $3 million from GEF under the Africa Minigrids Programme (AMP), which is being implemented by the UNDP. Under the Programme, there is a plan to install about 624 km of minigrid benefiting 31,000

41 https://www.thereporterethiopia.com/23824/
42 https://asteriskmag.com/issues/05/why-isnt-solar-scaling-in-africa
43 Ibid.
44 UNDP (2022)
45 FDRE (2019)

individuals. The AMP is also expected to boost productivity in agriculture, facilitate the urbanization process in the country, and directly reduce 16,836 tons of CO2eq emission.[46] [47]

Despite their high potential in curbing the energy deficit in isolated areas, the economics of minigrids are important because they may not always be the most cost-effective options. So far, the uptake of minigrids remain slow due to high investment risks and unproven business models.[48] The level of electricity service needed and the cost of providing it are key parameters. There are cases where extension of the main grid or stand-alone solar home systems could be better investments. Specifically, the cost-effectiveness of a minigrid depends on the characteristics of the site, which includes electrical load, cost of fuel, accessibility of renewable resources, cost of extending the main grid, number of new connections required, cost of renewable energy equipment and discount rate.[49]

C. Wind Energy

Ethiopia has some potential for wind energy. The eastern part of the country, alongside the Rift Valley and northeastern part of the country, are suitable for wind power generation. Specifically, the regions of Somalia and Afar, along with certain parts of the north, are known to possess the highest potential.[50] The country's total exploitable wind energy potential is around 10,000 MW. According to the WB's Wind Atlas, many parts of the country do not have sufficient wind speeds to allow wind turbines to operate successfully. Wind speed in the Somali and Afar regions range between 7 and 9 meter/sec, which is appropriate for power generation, but in Addis Ababa, most of Oromia, Amhara, and Tigray, the speeds are insufficient. Land ownership and access, security, and infrastructure complicate the picture.

Table 4: Current Wind Power Generating Plants

	Power station	Installed capacity (MW)	Year of operation
1	Adama I	51	2012
2	Ashegoda	120	2012
3	Adama II	153	2014
4	Ayisha II	80	2022
	Total	404	

Source: EEP[51]

The progress of wind farm development in the country is still in its nascent stages. Currently, only four wind farms have been constructed and integrated into the power grid, including Ashegoda, Adama I, Adama II, and Ayisha II (Table 4). Together, these wind farms have a total installed capacity of 404 MW. The government is developing other sites, especially Ayisha I & III and Assela. The wind farm in Assela, supported by the Danish government, has been under construction since December 2020 but is facing delays due to logistics challenges and security concerns. It plans to generate 100 MW using 29 turbines, but as of October 2024, only three turbines have been installed. The delayed launch of the project by the contractor, difficulty using the Djibouti road due to flooding, compensation issues for land, and high inland transport costs from the port have delayed the project.

46 https://www.undp.org/ethiopia/news/mini-grid-solutions-enhancing-ethiopias-energy-system

47 Power Africa, Department for International Development (DFID) and German Agency for International Cooperation (GIZ)'s EnDev program also provided financial and technical support to mini-grid projects in Ethiopia.

48 https://africanclimateactionpartnership.org/workplan/african-mini-grids-community-of-practice/

49 https://www.usaid.gov/energy/mini-grids/economics/cost-effectiveness

50 https://thedocs.worldbank.org/en/doc/960001461946242687-0010042016/original/EthiopiaWindMappingMesoscaleModelingReportFeb2016.pdf

51 https://www.eep.com.et/en/power-generation/

Wind energy generation has high upfront investment costs and is intermittent, depending on the weather and the ability to store energy. It needs to be integrated with storage hydropower to allow flexible generation. According to a review by the Danish agency Danida, wind is a challenge as private investors are reluctant to invest in Ethiopia due to a combination of high political risk, challenging institutional and regulatory framework, and low tariffs, making it impossible to generate adequate returns on the investments.[52] Thus, wind parks are currently financed by donors, in parallel with efforts aimed at building capacity and an improved framework for private investments.

D. Geothermal Energy

Geothermal energy is a significant source of renewable energy in East Africa. A large share of the geothermal energy potential of the African continent is near the Rift Valley region, especially in Ethiopia and Kenya. The geothermal energy generation process involves heating water using the earth's inexhaustible internal heat[53], which is eco-friendly since it does not emit greenhouse gases. It is a source of baseload energy as it can run 24 hours a day, regardless of the weather, and can be used for direct heating, electricity generation, and industrial processes. As of 2021, 16 GW of power was generated globally, constituting 0.5 percent of the global renewable power. The US is the highest generator of geothermal power with 3.7 GW, while Kenya is the top producer of geothermal power in Africa, with an installed capacity of 863 MW.

Ethiopia has a geothermal potential of over 7,000 MW.[54] Twenty-five potential areas are identified in the Ethiopian Rift Valley region. The current installed capacity is only 7.3 MW[55] but the power plant has not been operational since 2018 due to repeated technical failures.[56] The country plans to generate 3,500 MW from geothermal sources by 2030, however, based on the current trend, it is unlikely that the target will be meet. Despite the high investment cost, geothermal has a relatively low operational cost.

Geothermal projects face various risks. First, the geological sector is highly characterized by a lack of data availability, access, and utilization. Second, these projects require a high initial investment cost for exploration, drilling, and infrastructure setup. Third, securing adequate financing can be challenging. Fourth, there is a lack of local technical capacity and expertise in the sector.[57]

E. Biomass Energy

Ethiopia has a significant amount of household energy consumption through the burning of a large quantity of biomass. Traditional biomass sources like wood, cow dung, and agricultural waste are commonly used for cooking and heating in rural areas. The country's biomass energy potential is estimated to be 141.8 million tons per year. However, only 50 percent is currently exploited. Based on Ethiopian electric power, biomass contributes only 0.5 percent of electricity to the national grid. Asfaw et al. (2020) mentioned two compelling reasons for promoting biogas. First, Ethiopia is known to have the largest cattle population in Africa and secondly, the energy produced can be utilized in the form of light and cooking. On top of that, the byproduct can be used to produce organic fertilizer.

52 Danida Business Finance (2018)

53 Geothermal power plants draw fluids from underground reservoirs to the surface to produce heated materials that drive turbines to generate electricity.

54 MoWIE (2019)

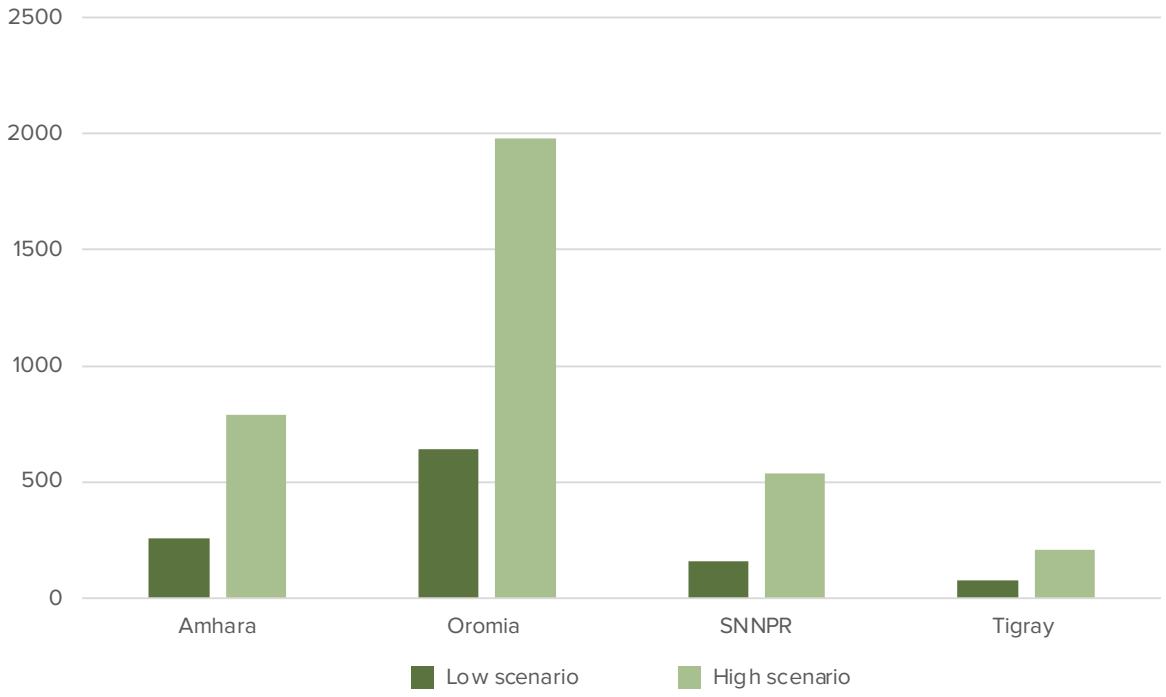
55 https://www.eep.com.et/?page_id=1033

56 https://www.afrik21.africa/en/ethiopia-eep-signs-epc-contract-for-aluto-langano-geothermal-power-plant/

57 The Geothermal sector was previously governed by Energy Proclamation No.810/2013 and Mining Operation Proclamation (as amended)

A simulation was run to estimate the biogas potential of the country. The Ethiopian Rural Development Promotion Center and SNV Ethiopia assessed two scenarios (low and high) of biogas production, and they found the following (in Figure 5): [58]

Figure 5: Technical Potential for Domestic Biogas in Ethiopia (number of households 000)



Source: Eshete et al. (2006)

58 Eshete et al. (2006)

Stylized Facts

This section looks at the five stylized facts about renewable energy costs:

> The falling global costs of renewables

> The intermittent nature of renewables leading to cost increases (although there are different estimates of the integration of wind and solar with hydro)

> Wind and solar are competitive but face high upfront investment costs

> Geothermal faces high upfront exploration and research costs

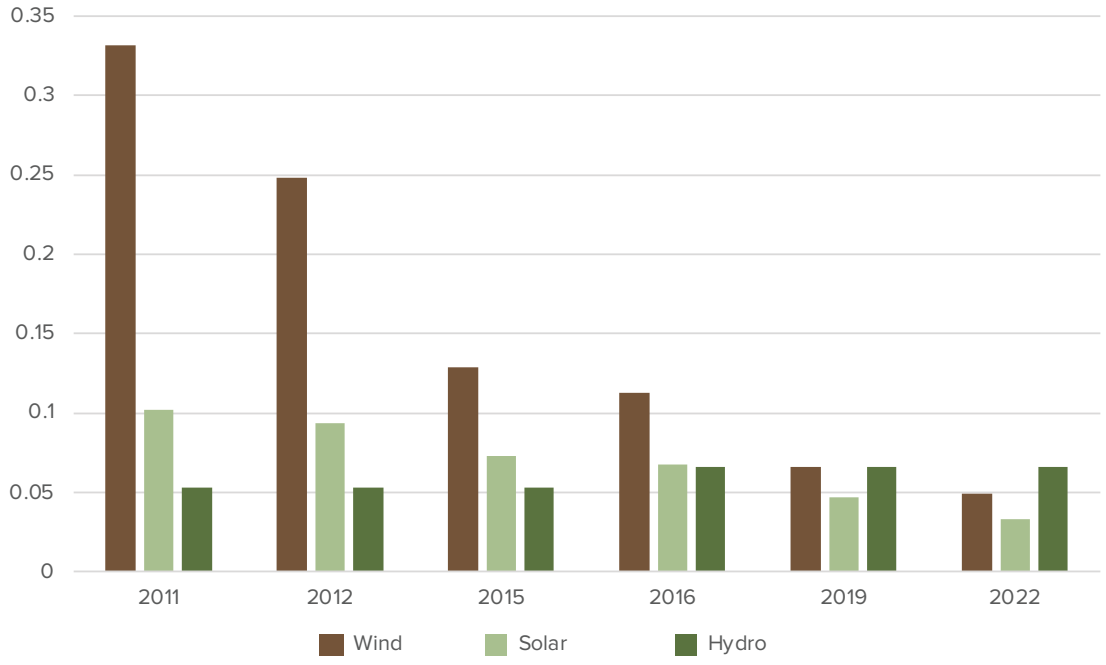
> Hydropower is competitive but may have social and environmental costs and funding challenges

A. Declining Cost of Renewables

Globally, renewables, especially wind and solar, have become much cheaper than they used to be in previous decades. Figure 6 depicts the trends in the cost of renewables. Spurred by innovative technologies in Europe, North America, China, and India, renewables account for close to three-fourth of all new capacity additions worldwide, eclipsing fossil fuels. They are potentially cheaper than most other sources of energy, such as fossil fuels. Partly prompted by cheaper and more efficient wind turbines, wind energy, both onshore and offshore, has seen important decreases in costs since 2010. The cost of onshore wind generation has declined for countries across the board (Figure 7).

The numbers are impressive. According to International Renewable Energy Agency (IRENA) (2023), the global weighted average cost of wind energy has declined 90 percent from $0.339/kWh to 0.033/kWh between 1984 and 2022, competing with solar PV and dethroning bioenergy, geothermal, and hydropower. The main reasons are technical improvements in the turbine technology, economies of scale, and reduction in operation and maintenance (O&M) costs. Global solar PV costs have fallen more than 70 percent in recent years to below $10 cents per kWh (Figure 8). The global weighted average levelized cost of electricity of utility-scale PV plants has declined by 89 percent since 2010. [60]

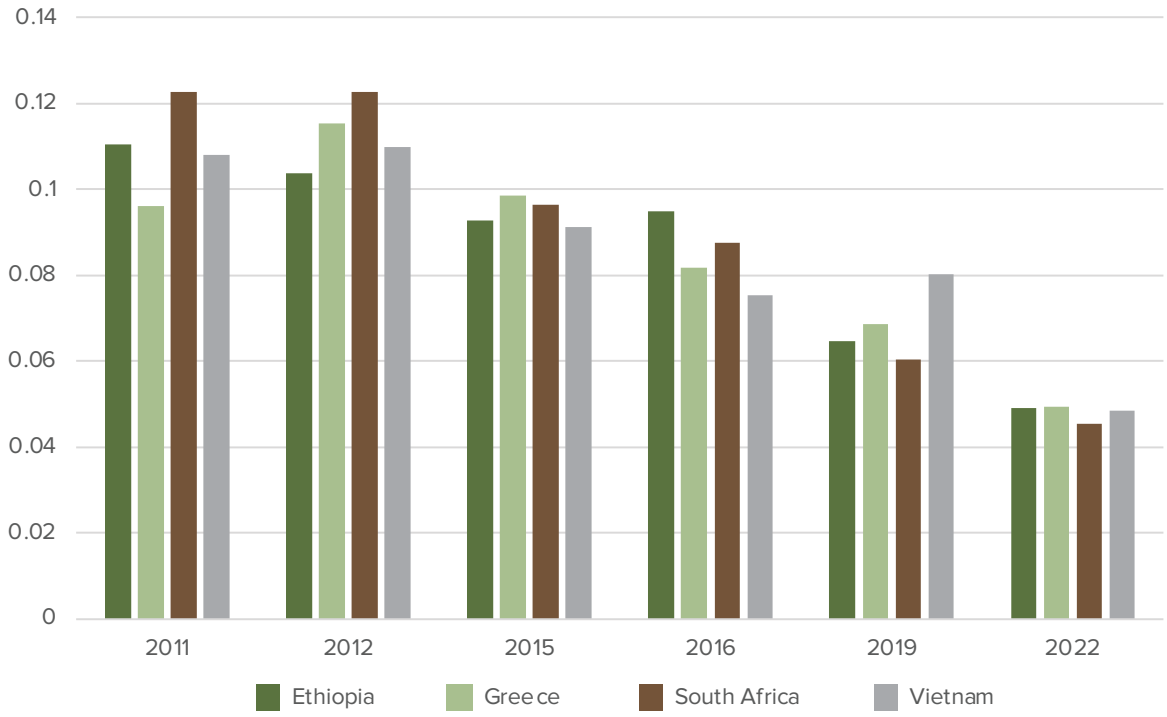
Figure 6: Comparative Global Energy Costs by Renewables (in USD/kWh)



Source: IRENA (2023)[61]

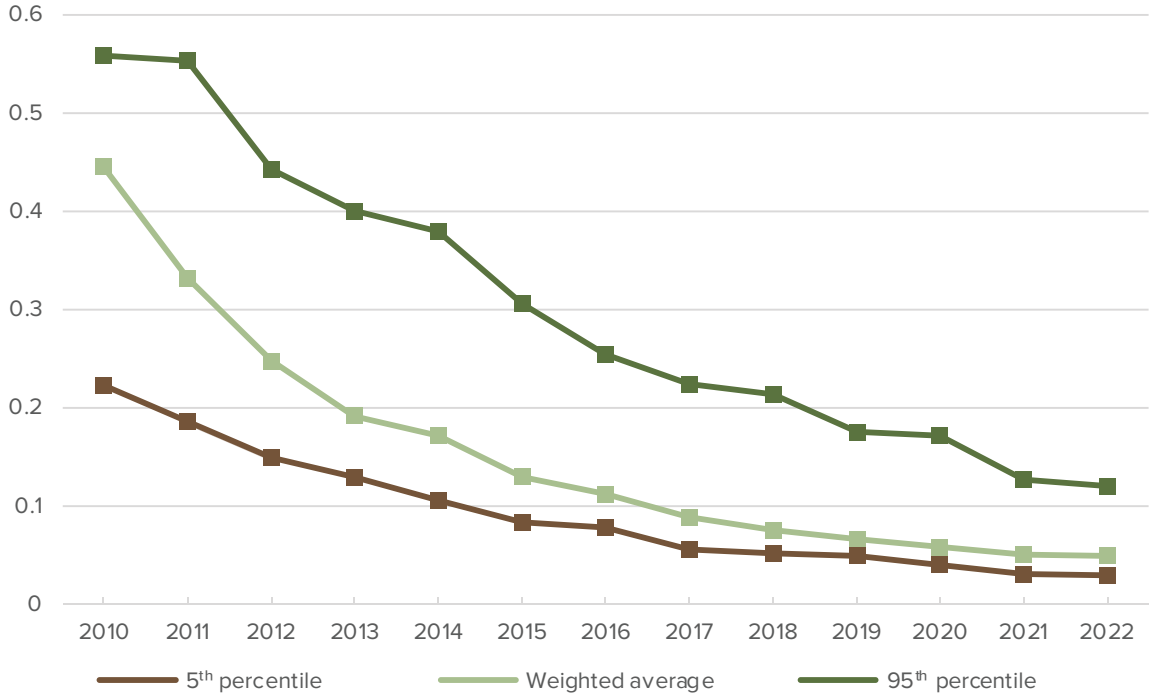
60 IRENA (2023)
61 Ibid.

Figure 7: Cost of Onshore Wind Generation (in USD/kwh)



Source: IRENA (2023)

Figure 8: Global Cost of 1 kWh Using Solar PV (in USD/kwh)



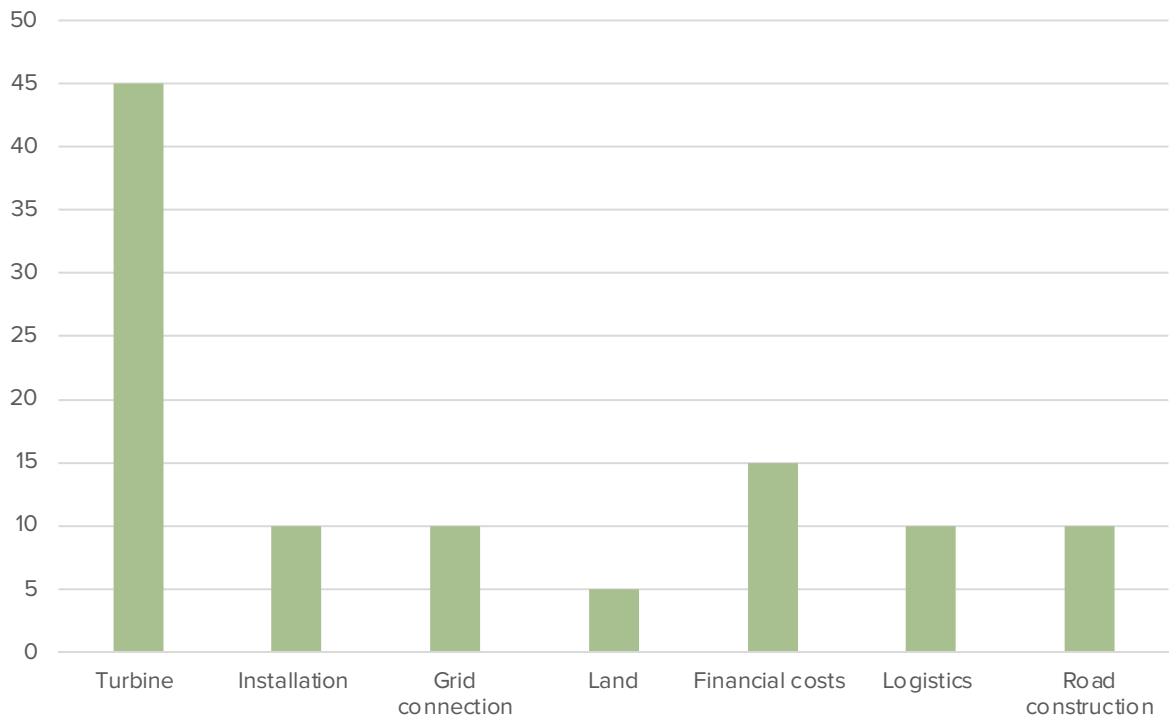
Source: IRENA (2023)

B. Intermittency and Renewables

The cost of renewable energy, particularly solar and wind, is significantly higher when one accounts for the intermittent nature of the supply of both types of energy. One important myth to demystify is that many forms of renewable energy can provide baseload energy. The intermittent nature of wind and solar translates into new economics. Despite rapid technological advancements in renewables and decreasing costs per kWh, large storage facilities are needed to ensure grid reliability. This has an escalating impact on costs.

Empirical analysis by the UNDP based on interviews with private sector operators conducted using data from wind and solar in Ethiopia shows that the costs of wind and solar energy can be a multiple of the current global estimates. This is true because the sun does not shine all 24 hours, and the wind does not always blow. There is a cost of recycling wind turbine blades and solar panels that leak toxic materials into the soil and water. Estimates for wind power include the cost of purchasing capital, turbine cost, and paying for O&M of wind turbines and the complex transmission lines.[62] In Ethiopia, wind energy has costly connectivity and logistics, huge capital expenditures (capex) investment, and works below capacity, which may not make it competitive. [63] The transportation of turbines from the Port of Djibouti to inland Ethiopia has become expensive and laborious, thereby increasing its upfront cost. Figure 9 provides a breakdown based on interviews.

Figure 9: Break down of Wind Costs (percentage of total)



Source: UNDP calculations based on interviews with the private sector

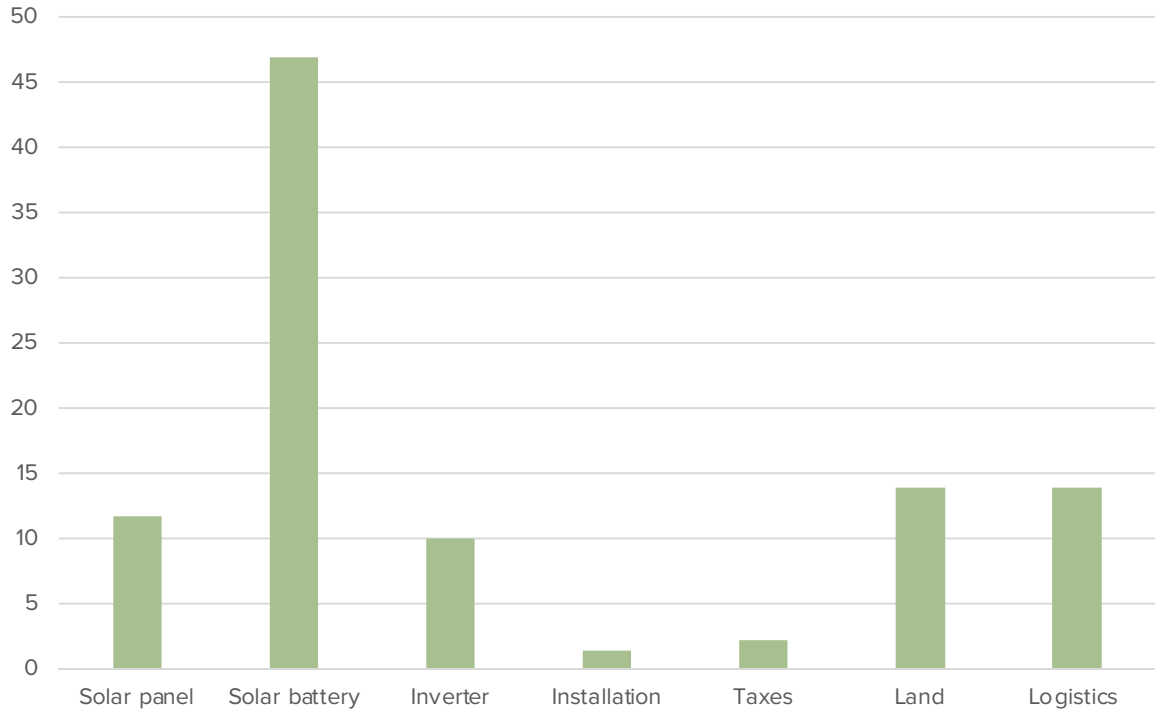
The price of solar energy declined by over 80 percent between 2010 and 2021. However, solar energy generation can be more expensive. First, initial upfront costs are high, especially for solar panels, batteries, and installation costs. Second, solar energy requires large and expensive batteries for the off-the-grid system. Third, there is the complex issue of land acquisition, where developers will

62 https://www.weforum.org/agenda/2015/04/how-much-does-wind-power-really-cost/

63 Stehly and Duffy (2021) estimated the average cost of wind energy. The average cost of wind energy is calculated using the levelized cost of energy (LCOE), with offshore and distributed wind energy project types being referred to as "reference projects." The LCOE inputs include project capital expenditures (CapEx), operational expenditures (OpEx), project financing (characterized by a fixed charge rate [FCR]), and the respective turbine capacity factor associated with the project.

have to collaborate with local authorities and the local community to obtain the necessary permits and land use rights. In Ethiopia, acquiring land can be lengthy and costly due to the bureaucracy. When factoring in reliability costs, such as the need for backup systems when sunlight is unavailable, the cost of solar energy could increase significantly, especially because of high-cost and low-capacity batteries. Finally, regulatory, taxation, and logistics considerations escalate the cost of solar. Transporting solar equipment from ports, fees, taxes, and other expenses adds to the costs (Figure 10). One global estimate by Professor Bjorn Lomborg argues that incorporating reliability costs can skyrocket the price of solar energy, suggesting an 11 to 42 times increase. [64]

Figure 10: Break down of Solar Costs (percentage)



Source: UNDP calculations based on interviews with private sector

C. The Geothermal Promise

Geothermal energy can be competitive despite its high exploratory and drilling costs as it is one of the baseload sources of electricity. The investment costs involve both the cost of exploration and drilling, with the latter being as high as 50 percent of the total cost, especially in high-temperature fields, leading to a cost as high as $6000 per kilowatt.[65] There are also relatively higher O&M costs because the plant requires regular maintenance of wells.[66] One advantage in Ethiopia is that developers can import equipment and machinery duty-free. The cost of generation is on par with fossil fuels. Still, banks are hesitant to finance geothermal energy projects due to high upfront costs, difficulties in resource discovery, and long payback periods, which are the major obstacles to their implementation.

There are recent developments in geothermal energy. Geothermal developers will sign a power purchase agreement with the EEP. The rates for electricity purchase can differ from project to project. For example, according to industry experts, the purchase tariff rates for Tulu Moye and Corbetti

64 https://addisfortune.news/soaring-hidden-costs-shine-behind-solar-wind-power/

65 https://link.springer.com/chapter/10.1007/978-3-030-86884-0_11

66 Currently, only a 7.5 MW pilot project has been established at Aluto Langano, with a 10 MW pilot project under construction at Tendaho Dubti.

geothermal projects are $0.0695 /kWh and $0.0753 /kWh, respectively. This is higher than solar production without storage, which is $0.02526. However, the highest retail consumer tariff is $0.044/kWh.

D. The Mixed Story of Hydro

Hydro is competitive regarding cost. Although it is the cheapest energy option available and more exploited than solar, it has a huge capex cost and lacks acceptance due to its social and environmental complexities and diseconomies. Unlike wind and solar, calculating the average cost of one kWh of electricity is complicated as it is affected by location, topography, inclination, water reservoir capacity, and plant design. Between 2010 and 2015, the weighted average was $0.053 per kWh. However, it has increased to $0.066/kWh for the years 2016 to 2022.[67] Therefore, despite its difficulty in generalizing due to large variations in its types, location, distance, and technology, the production cost of one kWh of energy has slightly increased. Ethiopia's extensive hydropower generation faces challenges in accessing external finance due to geopolitical issues and rigorous social and environmental assessments, thereby challenging the expansion of hydropower despite its low operational costs.

Case Study: South Africa

A case study of South Africa based on field visits yielded insights. South Africa is a global leader in solar and wind energy production and one of the first movers into wind and solar in Africa. In 2023, solar and wind production accounted for 12 percent of the country's electricity supply (with the remainder being coal), and it has been rapidly growing. The country receives renewable energy due to its geographic location, strong solar potential, and high wind speed power on the coasts in Cape Town and Western Cape. The Government is planning to reduce its reliance on coal by promoting investments in renewable energy resources and decommissioning coal and diesel energy sources. The Government targets include the decommission of 34 GW of coal-fired power by 2050. [68] The renewables Programme has led to over 6,000 MW of generation capacity granted to bidder across a range of technologies, primarily wind and solar.

The country has several advantages. First, there is significant local market potential with considerable land and highly skilled workforce. Second, South Africa has numerous local financing options with a track record in renewables. Third, it has expertise and technological capacity. Fourth, it has a welcoming local provincial and national government and enabling environment for electricity markets. Finally, it has developed a strong institutional architecture around renewable energy with many Ministries at national and local levels. It has competent agencies like WESGRO, a public agency providing expertise and promoting investment, renewable sector investment, and trade for Cape Town and Western Cape. It offers expertise, incentives, and other assistance to those looking to travel, invest, film or trade in Cape Town and Western Cape, including investments in the renewable energy sector.

67 IRENA (2023)

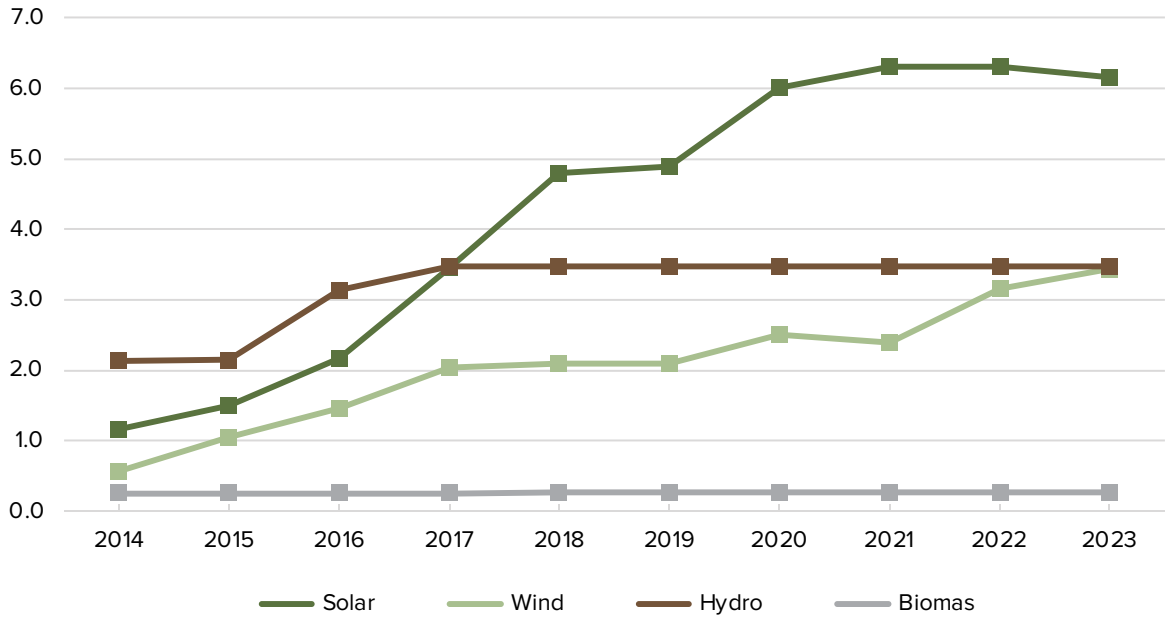
68 Studies have also shown that the country's power decarbonization is forecast to rise from about 15 percent currently to 60 percent by 2040.

The country has put in place several policies and incentives to promote energy efficiency and investment in renewable energy. These include the following:

- Renewable energy white paper 2003 and energy efficiency strategy 2005.
- Renewable Energy Independent Power Producers Procurement Programme (REI4P) introduced in 2011 at COP17 in Durban, South Africa, which aims at increasing electricity generation capacity through private sector investments in renewables.
- Amended the Income Tax Act 58 of 1962 to include accelerated depreciation for renewable energy assets commissioned by the tax paying entity.
- Introduced the "Green Cape" initiative and its objective is attracting investment to South Africa and creating jobs primarily in the manufacturing sector.
- The government is relaxing standards for local content in solar farms to speed up the implementation of solar projects.
- South Africa offers free feasibility studies for energy projects and is also home to the launch hub at Stellenbosch University green and tech incubator.

Private investment is becoming the main driver of renewable energy in South Africa. As of 2023 a total of 123 private sector investment projects with a capital of $17.3 billion have been committed to the REI4P. The key goal of REI4P is to reduce GHG emission and promote local manufacturing of materials used in the renewable energy sector. Investors sign a 20-year power purchasing agreement with the off-taker ESKOM to produce and sell electric power. The South African renewable energy sector has three components. These are a) solar and wind energy projects b) battery energy storage system and, c) transmission and distribution system. Green component manufacturing encompasses solar module assembly, battery technology and wind turbine components. Biomass is currently the largest renewable energy contributor with 9 to 14 percent of the total energy mix. Figure 11 depicts trends in renewable energy generation in the past ten years.

Fig 11: Trends in South Africa Renewable Energy Generation 2014 - 2023 GW



Source: WESGRO

Solar and Wind Energy

A UNDP field visit to a solar farm and a wind farm in the Western Cape yielded several key insights. First, South Africa has abundant solar and wind resources and significant private sector land, but it varies through the country. The solar energy potential is at an estimated capacity of up to 500 GW[69], while the total wind power potential is estimated at 60000 GW. In fact, a single wind turbine has a capacity of generating 1.8 MW to 4.5 MW of electric power annually depending on the size and speed of operation. Wind power has achieved success, with 34 operational wind farms boasting an installed capacity of 3.44 GW in 2023, and about 3.6 million households are supplied with electricity per year. Second, both solar and wind have faced declining costs in terms of panels and turbines, but there are high upfront installation costs, energy and battery storage constraints, and grid dependency. Transport of wind farm equipment, including blades, can be expensive given the size of the equipment. Also, technological advancements are making it possible for companies such as Umoya Energy in Western Cape to remain leading players. [70] Finally, there has been some progress on agreements to sell to ESKOM, but these are still at a nascent stage due to political and economic issues. The experience of South Africa shows renewable energy systems are costly to implement at the beginning but provide high economic returns overall as they are becoming more efficient, inexpensive, and widely used.

69 South Africa has high average solar radiation levels, between 4.5 and 6.5 kWh/m^2 per day

70 Located 125 km north of Cape Town on the R45 in the Saldanha Bay Municipality in the Western Cape province, Umoya Energy Wind Farm generates about 176 600 MWh of clean renewable energy every year.

Currently, Ethiopia faces a significant funding gap between its ambitions and its resources. It is estimated that implementing the NDC will require approximately $316 billion over a 10-year implementation period. The adaptation component accounts for $40.5 billion of the budget, and the mitigation rises to $275.5 billion. $63.2 billion will be unconditional, and $252.8 billion will be conditional. [71] According to the GoE, an assessment of the existing financing sources and their contributions to climate related investments (adaptation and mitigation activities) reveals that the NDC will have a financing gap of approximately $197.94 billion, which is equivalent to $19.7 billion annually. Box 3 shows the differences between mitigation and adaptation finance.

Box 3: Mitigation vs Adaptation Finance

Climate mitigation focuses on reduction or prevention of greenhouse gas emissions that cause climate change. **Climate adaptation** concentrates on ways of adjusting to the current and future impacts of climate change thereby creating resilience. Hence, mitigation and adaptation finance deal with funding of activities that help to achieve the objectives of climate change mitigation and adaptation, respectively.

Key global facts and trends: [72]

> So far, most funds are directed towards climate change mitigation.

> There are considerable funding gaps for both mitigation and adaptation.

> The largest mitigation investment gaps are observed in the transport and energy sectors.

> Over the years, adaptation finance grew only modestly.

> The global adaptation funding gap is widening (owing to the increasing impacts of climate change and the relatively slow growth of adaptation finance).

> Sub-Saharan Africa is the largest recipient of international adaptation finance (yet finance gaps are persistently high).

> Debt remains the main financial instrument for both mitigation and adaptation.

Ethiopia's CRGE strategy has helped the country achieve early wins. First, from 2011, a substantial proportion of adaptation activities took place in the agriculture sector, focused on soil, water conservation and crops, as well as in resource development for hydropower and irrigation sectors. These included large flagship resilience projects such as the PSNP, the SLMP, the ONE-Wash Programme and the GLI. Likewise, large-scale REDD+ interventions are implemented across the country that contribute to adaptation, even as they are predominantly designed to have mitigation impacts through reducing emissions from deforestation and enhancing carbon sequestration.

Stylized Facts

The larger part of climate finance is currently flowing from climate funds, multilateral and bilateral banks, and donors. Climate finance includes not only green energy, but it also includes climate adaptation. Table 5 and Table 6 provide data on climate finance (short term and longer term). According to a study by the Climate Policy Initiative (CPI)[73]:

> International public climate finance in Ethiopia was primarily channeled through grants (70 percent), with limited use of debt at the concessional (25 percent) and commercial rate (5 percent), and no equity financing. More than 62 percent of mitigation projects used grants for financing in water and wastewater (25 percent), agriculture (25 percent) and energy sectors (15percent).

71 FDRE (2021)
72 CPI (2023)
73 CPI (2022)

- Ethiopia attracted more climate finance for adaptation (50 percent) than mitigation (38 percent) — in stark contrast with the global average (7 percent and 90 percent, respectively).
- Agriculture, forestry, and other land use (AFOLU) is the highest contributor to GHG emissions in Ethiopia (83 percent) and received most of the finance ($486 million or 29 percent) in 2021.
- International public sources contributed 92 percent of the allocated funds while the contribution from private finance sources stands at a low level (8 percent).
- Balance sheet or project bond financing and project level equity played a negligible role together accounting for less than 3 percent of the tracked finance.

Table 5: Tracked Climate Finance by Source (2019-20)

Sources	$ Amount	Percent From total
Grand Total	1.7 billion	
International public (total)	1.56 billion	92 percent*
> Multilateral DFIs	770 million	> 49.5
> Bilateral	511 million	> 33
> Bilateral DFIs	140 million	> 9
> Multilateral climate funds	103 million	> 6.7
> Export credit agencies	32 million	> 1.8
Private (total)	138 million	8 percent*
> International	91.1 million	> 67
> Domestic	44.9 million	> 33

Source: CPI (2022); *as percent of grand total

UNFCCC multilateral climate funds[74] are important sources of climate finance. According to the MoPD, as of July 25, 2024 total funding by GEF and GCF for projects under implementation amounted to $259.7 million, where about 83 percent is sourced from GCF and 17 percent comes from GEF (under GEF-4 to 7 mainly through LDCF and SCFF).[75] Most of these finances were given as grants.[76] Ethiopia is part of three multi-country green energy Programmes that are funded by GCF, namely Universal Green Energy Access Programme, Leveraging Energy Access Finance, and Sustainable Renewables Risk Mitigation Initiative. Similarly, GEF financed the Promoting Sustainable Rural Energy Technologies for Household and Productive Uses Project, and the Renewable Energy Project in Ethiopia.

MDBs are among the main providers of loans and grants to fund projects with social and economic impact including climate finance. In Ethiopia, the WB finances various green projects and climate change related activities. Concerning green energy, WB financed electricity network and access expansion projects. Ethiopia's Geothermal Sector Development Project is another green energy project which obtained funding from the bank. WB also provided institutional support to the Renewable Energy Guarantees Programme Project. The AfDB is another significant provider of climate finance for Ethiopia. AfDB provided $10 million concessional loan for the Tulu Moye geothermal power plant through the CTF and $95 million in loans and grants for the development of power interconnection between Ethiopia and Djibouti.

74 UNFCCC coordinates the GCF, AF, the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF). Under the guidance of UNFCCC, the GEF administers the LDCF and SCCF. The WB coordinates the other main multilateral fund, Climate Investment Funds (CIF). The CIF consist of two funds, the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF).

75 MoPD (2024)

76 The eighth replenishment cycle of the GEF (GCF-8 spanning from 2022 to 2026) allocated a total of $23.8 million to Ethiopia.

Bilateral climate finance sources include development cooperation agencies and national development banks. Through GIZ, its development agency, Germany provides financial, and capacity building support to renewable energy projects in Ethiopia. Norway provided support to renewable energy activities in Ethiopia such as through the NORHED II Renewable Energy and Technology Network Programme. Denmark supported wind power accelerating projects in Ethiopia including finance provision for the construction of the Assela wind farm. Italy is a significant financer of hydropower projects in Ethiopia, including Gilgel Gibe II and Koysha. Through the Power Africa Programme, the United States Agency for International Development (USAID) is supporting the development of Ethiopia's energy sector. China provided debt finance for several renewable energy projects.

However, the climate finance figures that are reported by the Organization for Economic Cooperation and Development (OECD) should be taken with caution." A recent study by One Data Commons identified several caveats of the OECD Climate-related Development Finance dataset. First, climate finance commitments are overstated. Second, significant portions of the commitments are not disbursed or there is no record of their disbursement. Third, due to lack of standardized reporting guidelines, there is a tendency to count projects that have a climate component as 100 percent climate finance despite having little or nothing to do with climate goals. Fourth, climate finance reporting systems suffer from many other flaws including messy data and lack of timely reporting.[77] A finding by Oxfam complements this. Between 2017-2023, up to $41 billion of the World Bank's climate finance went unaccounted. [78] In addition, many countries, especially in Africa, lack strong systems to track both government and donor climate-related expenditures because they cut across existing expenditure classification systems.

77 https://datacommons.one.org/climate-finance-files

78 Oxfam (2024)

Table 6: Ethiopia's Major Climate Finance Sources (Commitments) in Current $Millions (2000-2022)

Source of Finance	Years: 2000-2022
Multilateral Climate Funds	**340.9**
AF	10
CIF	28
GCF	220.1
GEF	82.8
Multilateral Development Banks	**5573.9**
AfDB	437.3
EIB	15.2
WB	5121.4
Bilateral	**6346.8**
Canada	295.6
Denmark	221.7
EU Institutions (excl. EIB)	687.5
France	307.9
Germany	847.0
Ireland	271.7
Italy	161.4
Japan	322.9
Korea	118.8
Netherlands	570.4
Norway	503.0
Sweden	100.1
United Kingdom (UK)	1010.2
United States of America (USA)	928.6
TOTAL	12,261.6

Source: OECD (DAC) database, 2024[79]

There is a growing literature on greenwashing, which refers to mis-labelling investments as green when the investments do not actually contribute to the goals of the Paris Agreement. There are growing concerns amidst the policy community that some net-zero pledges are being used to cover up massive fossil fuel expansion. Moreover, some climate projects are not fully climate projects. Recently, the Secretary General of the United Nations set up a High-Level Expert Group tasked with developing stronger and clearer standards for net-zero emissions pledges by companies, financial institutions, cities and regions, and speed up their implementation. In sum, there is a strong push for clearer transparency and accountability in assessing climate finance.

79 https://web-archive.oecd.org/temp/2024-06-04/315401-climate-change.htm

There is significant potential to mobilize climate finance from a variety of sources. Following the definition of the UNFCCC, climate finance is any funding from public, private and alternative sources that seeks to support climate change mitigation and adaptation actions. The goal is to both reduce GHG emissions and improve the resilience of human and ecological systems to the impacts of climate change. The funding can be in the form of loans, grants, bonds, guarantees, debt swaps, or other financial instruments.

A. Multilateral Sources

The first important source of climate finance are multilateral sources — the UN-sponsored vertical funds (GEF-GCF) or the international financial institutions. As mentioned above, these are already key sources of funding for Ethiopia, but further funding is crucial. At present, according to the System for Transparent Allocation of Resources (STAR) formula, Ethiopia obtains on average about $20 million over a four-year period. The GEF uses the STAR to make an "indicative allocation"[80] to eligible countries in a replenishment period. Indicative allocations are calculated based on a combination of the GEF benefits index (GBI), the GEF performance index (GPI), and a social and economic index based on the Gross Domestic Product (GDPI).[81] In August 2023, Ethiopia argued that the calculation used by GEF STAR to allocate is primarily based on the findings of the Independent Evaluation Office using data available before 2017, which does not reflect the current situation, and that the STAR allocation should consider the country's vulnerability to the impacts of climate change.[82]

Ethiopia may be able to get more GEF funds if it markedly improves indices used by GEF STAR to calculate country scores and indicative allocations. Ethiopia's quota from GEF STAR can potentially increase under improved situations, which includes, (1) increased forest coverage, (2) strong environmental policy and institutional setting, and (3) enhanced capacity to implement GEF-funded projects. In addition to GEF STAR allocation, there are several projects in the pipeline, which are submitted by Ethiopia to the GEF for approval. The total GEF funding requested for these projects is about $52.9 million, which is expected to be obtained from various GEF trust and set-aside funds.[83] Most of these projects are not directly related to renewable energy but the experiences obtained from their execution can be used to secure more funding for renewable energy development in the future. The good news is that in the last two decades, the GEF has invested $1.1 billion in renewable energy initiatives in almost one hundred developing countries.

The GCF is another important source of climate finance for Ethiopia, where Ethiopia has been recently upgraded. To promote renewable energy, the GCF focuses on three main areas: energy generation from renewable sources such as wind, solar, geothermal, hydro, and sustainable bioenergy; efficient and reliable energy transmission, distribution, and storage; and promoting access to clean energy in a way that promotes sustainable development and climate resilience while reducing emissions.[84] Ethiopia's renewable energy projects are highly compatible with the six investment criteria of the GCF.[85] Ethiopia can improve its stance on these standards to enhance finance access from GCF, particularly the country ownership criterion. Ethiopia has been collaborating with GCF to be able to access a higher tier of

80 The funding envelope that a given country can access during a replenishment period.

81 GEF (2010) and GEF-IEO (2018) – The GBI represents the global environmental benefits that can be generated for each focal area in a specific country. The GPI uses information from two sources: the World Bank's Country Policy and Institutional Assessment (CPIA) scores for a country, and data on the performance of GEF projects in a country. The GDP-based index is introduced as the new feature of STAR with the objective of providing additional funding access to poor countries.

82 https://www.epa.gov.et/latest-news-of-the-authority/ethiopia-requests-the-gef-to-amend-its-system-for-transparent-allocation-of-resources-star.html

83 MoPD (2024)

84 https://www.greenclimate.fund/results/energy-generation-access

85 The six investment criteria of GCF are (1) impact potential, (2) paradigm shift potential, (3) sustainable development potential, (4) needs of the recipient, (5) country ownership and (6) efficiency & effectiveness [for details see https://www.greenclimate.fund/sites/default/files/document/investment-framework-criteria-assessment.pdf].

capital for projects. A country's policies, climate strategies and institutions determine its ownership of, and capacity to implement a GCF funded project. At present, the GCF has allocated funding to Ethiopia through ten projects totaling $372.3 million and five readiness activities with an approved support of $4.5 million. Out of these projects, four of them are renewable energy related indicating that Ethiopia already has experience in accessing GCF funds for such projects.[86]

A third source of multilateral climate finance could be the IMF and World Bank. The IMF's Resilience and Sustainability Trust (RST) helps low-income and vulnerable middle-income countries by providing long-term and affordable financing to address enduring challenges, including climate change.[87] As part of the Extended Credit Facility (ECF), the IMF plans to unlock additional climate finance through the RST to support ongoing climate efforts in Ethiopia. At present, the RST disbursements are low. Findings from two recent studies, the Climate Public Investment Management Assessment (C-PIMA) and the Country Climate and Development Report (CCDR) will be used to improve the climate-sensitiveness of planning activities and projects in Ethiopia.[88] The WB has also pledged to support the transition from the public sector to a private-sector-driven renewable energy sector through its renewable energy guarantees Programme, which will seek to mobilize over $1.5 billion in investments from the IPPs to generate 1000 MW from solar and wind over a period of six years.[89]

A fourth source of renewable finance could be via the African Development Bank. The Sustainable Energy Fund for Africa (SEFA) is a multi-donor Special Fund managed by the AfDB that provides catalytic finance to unlock private sector investments in renewable energy and energy efficiency. It offers a combination of technical assistance and concessional finance instruments to remove market barriers, strengthen the pipeline of projects, and improve the risk-return profile of individual investments for companies.

A fifth source could be the European Investment Bank (EIB). It houses the Africa Renewable Energy Fund (AREF), which invests into small hydro, wind, geothermal, solar, stranded gas and biomass projects across Sub-Saharan Africa (excluding South Africa). It has a plan to make between 8 and 12 investments in renewable energy projects, targeting controlling positions in medium size projects in all development stages, with an energy output between 5 and 50 MW. This is a good potential for finance for countries like Ethiopia.

B. Bilateral Sources

Besides multilateral sources, bilateral funders can continue to be important source of climate finance for Ethiopia.

- **Germany** reassures that it will continue its support to the implementation of Ethiopia's NDC particularly focusing on renewable energy development and access. In addition, Germany showed commitment to assisting Ethiopia with stakeholder engagement, capacity building, and the development of a climate information system to boost the country's capacity in mobilizing climate finance.[90]
- **Norway** will remain a major supporter of forest and land management, protection, and restoration activities in Ethiopia. Recently, Ethiopia and Norway signed a $75 million climate partnership agreement, which extends Norway's support to forest and land-related activities up to 2030.[91]

86 https://www.greenclimate.fund/countries/ethiopia
87 https://www.imf.org/en/Topics/Resilience-and-Sustainability-Trust
88 IMF (2024)
89 World Bank (2024)
90 https://www.mopd.gov.et/en/news/articles/germany-and-ethiopia-strengthen-climate-partnership-after-bilateral-meetingnonenone/
91 https://www.mofed.gov.et/blog/ethiopia-and-norway-signed-a-75-million-usd-climate-partnership-agreement/

- **The UK** is expected to continue providing technical and financial support to increase Ethiopia's ability to access more climate finance. In 2023, the UK committed GBP 90 million for the purpose.[92] Moreover, the USA, Korea, and other partners are also expected to continue to provide bilateral climate financing in Ethiopia.
- **China** is another important bilateral player. It has been the largest bilateral lender to Africa in the last two decades. China has shown its commitment in this regard by pledging $51 billion with a substantial portion going to infrastructure projects. It has committed to fund 30 new clean energy initiatives in Africa in the coming years as part of its shift in lending towards renewables..

C. Blended Finance

Blended finance constitutes a useful mechanism to channel money to African countries. Emerging in the early 2000s, it aligns with the global commitment to the SDGs set for 2015–2030. At that time, it was estimated that developing countries would need around $4.5 trillion each year to meet these goals. Jointly supported by donors and governments, blended finance offers a solution by merging public and private funding sources using a range of financial instruments (including concessional lending), effectively bridging this resource gap.[93] A joint report of the OECD and World Economic Forum (WEF) (2015) defines blended finance as "the strategic use of development finance and philanthropic funds to mobilize private capital flows to emerging and frontier markets." By leveraging catalytic capital from public or philanthropic entities, it encourages private sector investment in emerging markets. This approach holds promise, particularly for high-impact sectors like infrastructure and renewable energy. Currently, the industry is confronted with an annual funding shortfall of nearly $1.6 trillion, highlighting the urgent need for blended finance to unlock these vital resources.[94]

Blended finance can catalyze renewable energy investment in low-income countries. It has shown a significant increase in recent years. Between 2015 and 2021 it generated an aggregate amount of over $160 billion. One of the notable advantages of blended finance lies in its capacity to strategically leverage modest amounts of donor funding to enhance a project's risk profile. It has been seen that incorporation of blended financing to project financing where it is complemented with other forms of financing eases investors' concerns regarding risks. Blended financing has attracted 61 percent of concessional financing in Africa in 2020, mainly for renewable energy development investment.[95] However, the pace of blended finance in Africa has slowed in recent years due to the small size of projects, limited investor appetite, and challenges in finding risk-sharing formulas between the public and private sectors. As a result, most blended finance has globally gone to middle income countries.

There are some limited blended finance experiences in Ethiopia. The main blended finance initiatives to date focus on the energy and the financial sectors, namely the Assela Wind Power Project and financing of Vision Fund Microfinance Institution (VFMI). However, attracting further private investors to engage in blended finance would require economic as well as political stability. Multi-stakeholder engagement and discussions need to be conducted in a structured manner to elevate blended finance in Ethiopia.[96]

92 https://www.mopd.gov.et/en/news/articles/ethiopia-and-uk-discuss-climate-change-cooperation-at-high-levelnonenone/

93 Three pillars of blended finance are: 1) Leverage: where development finances are used as a catalytic fund to attract private capital to developing countries. 2) Impact: the deliberate act of attracting private investment to high development impact sectors with an objective of achieving social, environmental, and economic progress. 3) Returns: ensuring attractive investment returns in the face of high real and perceived risks in markets of developing countries.

94 OECD and WEF (2015)

95 https://blogs.worldbank.org/en/ppps/blended-finance-can-catalyze-renewable-energy-investments-low-income-countries

96 Merchant and Munene (2023) https://www.convergence.finance/news/3kOFbF0Zvt3dQB5Gto5k5g/view

D. Public-Private Partnerships

Public-private partnerships present alternative sources of funding for renewable energy. Several countries, including Egypt, Morocco, and South Africa have mobilized PPPs to harness solar energy. There has been a successful attempt to court private capital by offering public support. According to the IEA, the cost of capital for a typical utility-scale solar project can be two or three times higher in key emerging economies than in advanced economies or China, reflecting real and perceived risks at the country, sectoral and project levels.[97] The most prominent cases are the Noor Ouarzazate complex in Morocco and the Renewable Energy Independent Power Producer Procurement Programme in South Africa.

A significant part of investment in solar and wind can come from the private sector. One study finds that after a government body enters into a concession agreement with the private sector for a specific project, it can decide to take an equity commitment in the project's financial structure, participate actively in the development of the project, and receive a risk-adjusted return. [98] Another option suggested is for the government to become an "off-taker" or buyer, typically through its public utility, and commit to buying the project's services for a specified period. Off-take agreements can take different forms depending on the type of asset (generation, transmission, distribution, etc.). However, it is important to find a formula where risk is equally transferred between public and private sectors and a potential system where there can be guarantees.

E. Golden Trifecta: Green Bonds, Debt Swaps and Carbon Credits

Green Bonds

Ethiopia has a potential to generate finance for its renewable energy projects by issuing green bonds, but there are many prerequisites. Green Bonds are innovative market-based instruments that are used to raise funds and finance investments with environmental or natural resource benefits. In Africa, only Kenya, South Africa, Nigeria, and Seychelles have issued sovereign green bonds as of 2024. The International Climate Market Association (ICMA) defines Green Bonds as "any type of bond instrument where the proceeds or an equivalent amount will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects and which are aligned with the four core components of the Green Bond Principles (GBP)". [99]

A review of international experience confirms that the first step in issuing a green bond is to identify an eligible project. Ethiopia has conducted the feasibility study of several renewable energy projects, but they will not be eligible unless they are advanced to the bankable stage. The next challenge is for Ethiopia to match issuers with potential investors. The other steps are identifying green projects, managing proceeds, reporting to investors, and monitoring and evaluation. Besides the lack of a pipeline, Ethiopia's central bank has not provided a clear regulatory framework for green bonds.

Green bonds must have a reliable revenue stream for payment to investors. The projects should include a business model to guarantee benefits that can be collected as revenues.[100] If Ethiopia works on the bankability of its numerous candidate renewable energy projects, it can generate millions of dollars in green bonds until 2030. Studies about the eligibility of renewable energy projects for green

97 https://www.iea.org/reports/scaling-up-private-finance-for-clean-energy-in-emerging-and-developing-economies/executive-summary

98 https://www.energypolicy.columbia.edu/publications/public-private-partnerships-in-the-african-energy-sector/

99 Green Bonds can be issued by governments, international organizations, multilateral development banks, national development banks, commercial banks, and corporations.

100 Hyman (2022)

bonds can be supported by finance sources like the hydropower sustainability fund.[101] According to the UNDP, the global green bond market can be worth between $4.7 trillion and $5.6 trillion by 2035.[102] Renewable energy projects are among eligible green projects identified by ICMA that can benefit from the proceeds of green bonds. Globally, annual green bond issuance solely for renewable energy increased from $2 billion in 2013 to $38 billion in 2019. However, green bonds still only constitute a small share of global renewable energy financing. Box 4 shows the experience of India, one of the green bond pioneers.

Box 4: Green Bonds for Green Energy Finance – India

On February 1st, 2022, Union Minister for Finance and Corporate Affairs, Ms. Nirmala Sitharaman announced the Government of India's plan to issue sovereign green bonds to mobilize resources for green infrastructure. The proceeds will be deployed in public sector projects that contribute towards reducing the carbon intensity of the economy. On January 25, 2023, India issued the first tranche of its first sovereign green bond worth INR 80 billion (equivalent to $980 million). On February 9, 2023, the Government of India announced the issuance of another INR 80 billion ($968 million) in sovereign green bonds.

The sovereign green bonds showcase India's commitment to expanding renewable energy production and reducing its carbon intensity by supporting expenditures for renewable energy and electrification of transport systems. Investments in these sectors are particularly important as they represented around 41 percent of India's GHG emissions in 2019 and are expected to account for two-thirds of emissions by 2050 as the economy continues to grow. Green bond proceeds allocated to renewable energy will support the rollout of well-proven renewable energy technologies (solar power, followed by wind and small hydro), as well as research and development of innovative technologies, such as tidal energy. This is particularly important to support India's energy transition journey, as currently coal is the country's main source of energy, accounting for 55 percent of the energy needs.

Financial institutions and government agencies have used the instrument since 2015. Indian green bond issuances have reached a total of $21 billion as of February 2023. The private sector was responsible for 84 percent of the total. The largest green bond issuer in India Greenko Group is funding hydro, solar, and wind power projects in several Indian states with its green bond proceeds. Ghaziabad Nagar Nigam, a civic body in Uttar Pradesh, is the first Indian local government to have issued a green bond (equivalent $20 million in 2021). Indore Municipal Corporation issued $87 million in green bonds in 2023. Indian issuers have issued a greater amount of green bonds ($21 billion) than other emerging markets in Asia, excluding China.

Source: Hussain and Dill (2023)[103]

Debt for Climate Swap Initiative

A second approach is a debt for climate swap. A debt-for-climate swap is an "agreement between a debtor country and its creditors, where the former's debt stock is reduced in exchange for a verifiable commitment to invest in climate mitigation or adaptation projects." [104] Developing countries are already facing the heavy impacts of climate change and need a huge investment for adaptation and mitigation projects.

101 https://www.hydropower.org/news/hydropower-sustainability-fund-now-open-to-40-countries-worldwide

102 https://www.undp.org/zambia/news/green-bonds-new-frontier-zambias-sustainable-path

103 https://blogs.worldbank.org/en/climatechange/india-incorporates-green-bonds-its-climate-finance-strategy

104 Sirimaneetham (2021)

A debt-for-climate swap can be agreed directly between a bilateral or multilateral creditor and the debtor country or with the involvement of a third party. In the first case, the creditor agrees to cancel or reduce a country's debt in exchange for the debtor's commitment to invest in approved climate related or green projects. In the second case, a third party, like a non-governmental organization (NGO), engages in purchasing a developing country's debt in the secondary market at a discounted value and then transfers it back to the debtor in exchange for the government's commitment to mobilize funds for specific projects. [105] In the past, even if debt-for-climate swaps were mainly focused on forests and biodiversity conservation Programmes, the instrument can also be used to finance renewable energy development. [106]

International Institute for Environment and Development (IIED) estimated that more than $100 billion of debt in developing countries could be freed up to spend on restoring nature and adapting to climate change. IIED's analysis focuses on the forty-nine countries most at risk of defaulting on their external debts for which data could be found. The collective public external debt owed by these countries reached $431 billion in 2022 according to the IMF and the World Bank. Twenty-nine of the nations included in IIED's analysis are part of the Least Developed Countries Group, which negotiates as a bloc at United Nations climate talks. The analysis found that debt-for-climate-and-nature swaps could free up $33.7 billion for these countries which is way above the $6.1 billion they received in climate finance in 2021. Overall, the 49 countries IIED analyzed received $13.8 billion in climate finance in 2021, according to OECD figures, which is significantly less than what they need. The amount of money that could be freed up through swaps also vastly outweighs the roughly $700 million pledged to the COP28 'loss and damage' fund so far. [107]

Ethiopia, like more than 50 other developing countries, is facing a significant debt burden and is one of the most climate-vulnerable countries. As a highly indebted country, in addition to debt restructuring, the country will also be eligible for a debt-for-climate swap with its bilateral creditors in the coming years. This means that it can work with creditor countries to invest in specific climate change mitigation or adaptation projects using the allocated funds. Some countries, especially European, will be interested, while others, such as China and Japan, are normally not amenable to such swaps. The German government has established a bilateral swap Programme with developing countries. [108] Kenya has benefited from EUR 60 million in the areas of renewable energy and sustainable agriculture. Similarly, Egypt benefited from a swap of EUR 54 million to strengthen the national power grid operated by the Egyptian Electricity Transmission Company (EETC). This initiative is also applied in Tunisia, with EUR 15 million of sustaining coastlines. Currently, many African countries are considering this option, as demonstrated in the meeting of African finance ministers in 2023.

Ethiopia's proposals can be several. Climate finance should address a multiplicity of activities, beginning with renewables, but it should also address food security and forestry. These projects can involve working on renewable energy generation and transmission projects, promoting climate resilience to enhance food security and youth employment, and improving rural roads to ensure better market access for farmers. If successful, Ethiopia could benefit approximately $100 million from its bilateral creditors through debt-for-climate swaps up to 2030. Additionally, with support from the IMF/WB and bilateral partners, Ethiopia may be able to swap a portion of its debt for climate and nature projects. [109]

105 Ibid.

106 Additional eligible projects include utility-scale battery energy storage; compensation for early shutdown of coal-fired power plants; energy efficiency improvements in industry, urban transport, and buildings, climate-resilient agriculture; and more resilient infrastructure and human settlements.

107 https://www.iied.org/debt-swaps-could-release-100-billion-for-climate-action

108 https://www.Bmz.De/En/Issues/Climate-Change-And-Development/Climate-Financing/Debt-For-Climate-Swaps-195550

109 https://iied-my.sharepoint.com/:x:/g/personal/jon_sharman_iied_org/EY_

Carbon Credit

The third approach is carbon credits, which value emissions and offer financial rewards to businesses and governments for lowering their carbon footprints. Carbon markets have buyers who can achieve their emission reduction goals through the exchange of carbon credits. Sellers, on the other hand, can use it as a source to finance their sustainable development. The market has two components: voluntary market and compliance market. Box 5 surveys the recent developments in Article 6. The compliance market is regulated by mandatory national or international carbon reduction entities. The value of compliance global carbon trade has reached about $948.7 billion in 2023 in exchange for nearly 12.5 billion metric tons of carbon permits.[110]

The Ethiopian government has placed significant emphasis on forestry and other natural resources. According to the National Forest Sector Development Programme (NFSDP 2020 – 2030), the sector is expected to contribute to nearly half of the national CO2 emission reduction plan. Successful implementation of this plan also seeks broader economic benefits, targeting an increase in the forest sector's contribution to the overall economy from 4 percent in 2015 to 8 percent by 2030. In line with these goals, the GTP II plan has resulted in the production and planting of 15 billion seedlings across 2.6 million hectares.[111]

Box 5: Article 6 of the Paris Agreement

Article 6 of the Paris Agreement emphasizes the opportunity for countries to engage in voluntary cooperation as they implement their nationally determined contributions. By working together, countries can achieve greater positive impacts in their climate actions. Under Article 6, countries are able to transfer carbon credits earned from the reduction of greenhouse gas emissions to help one or more countries meet their climate targets.[112] It focuses on the development of carbon markets, places where countries, companies and individuals can trade what are known as greenhouse gas emissions credits. The Voluntary Carbon Market experienced an average growth rate of 30 percent from 2016 to 2021 and is expected to expand exponentially by 2030. However, only 11 percent of the total carbon credits issued worldwide during this period came from African countries. Additionally, studies indicate that Africa utilizes only 2 percent of its maximum annual potential for carbon credits.[113] During COP27, the Africa Carbon Markets Initiative was established aiming to generate 300 million carbon credits yearly.

The most recent Ethiopia NDC has interesting findings. LUCF is the second biggest emitter on business-as-usual scenarios and accounts for the highest mitigation potential in Ethiopia. Forest cover has been continuously regressing. Studies show that forest coverage was 40 percent of the country's territory in 1994, which has lowered to an estimated 11 to 15 percent in 2015.[114] Figure 12 shows the yearly tree cover loss. The updated NDC predicts that forest coverage can grow to 30 percent by 2030. The extent of forest coverage will depend on resource mobilization, both domestically and internationally.

gsXns5TVAti9olMxHg8EBeRJ61bdZLBd4Ls6z7tJaq?rtime=dslrscjT3Eg

110 https://www.reuters.com/markets/commodities/global-carbon-markets-value-hit-record-949-bln-last-year-lseg-2024-02-12/

111 Environment Forest and Climate Change Commission (EFCCC) (2020)

112 https://unfccc.int/process-and-meetings/the-paris-agreement/article-64-mechanism

113 AUDA – NEPAD (2024)

114 Mohammed et al. (2023)

Figure 12: Yearly Tree Cover Loss (Hectares)

Source: World Rainforests [115]

Ethiopia received Africa's first forestry carbon credits back in 2012 under the Clean Development Mechanism (CDM). By December 2022, Ethiopia had issued over 2 million carbon credits under the CDM and Voluntary Carbon Market (VCM) standards. In February 2023, Ethiopia signed a $40 million contract with the World Bank's BioCarbon Fund Initiative for Sustainable Forest Landscapes (ISFL). The goal is to increase carbon sequestration through forest preservation and other environmentally friendly land uses. The emission reductions purchase agreement will be implemented under the Oromia National Regional State Forested Landscape Programme, rewarding 4 million metric tons of CO2 emission reduction by 2030. Close to 75 percent of the proceeds will directly benefit local communities.[116] Through this collaborative endeavor, Ethiopia is working towards a more sustainable future, fostering partnerships that benefit both the environment and local communities.[117] In this regard, Ethiopia can also benefit from the recently launched initiative by the UNDP, which promotes high integrity carbon markets that truly reduce environmental impact, and safeguard indigenous rights and human dignity while generating finance.[118]

The country is taking various approaches to developing forests for carbon trading and sequestration. Ethiopian Forestry Development (EFD) notes that the country is expanding its efforts in carbon trading and sequestration through sustainable forestry practices. EFD has also launched 1 million hectares of participatory forest management, in which the community will actively participate. It has also established a national forest monitoring system and facilitated a EUR 12 million carbon trade in Bale, where 65 cooperatives participate.

The Council of Ministers recently approved a new regulation formalizing and legalizing carbon trading practices. This regulation opens the opportunity for private developers to participate in carbon trading, which allows them to receive payment from beneficiaries for providing "forest ecosystem services." These services can include the provision of drinking and irrigation water, the

115 https://worldrainforests.com/deforestation/archive/Ethiopia.htm
116 WB (2023)
117 https://cvfv20.org/relevance-of-carbon-market-for-ethiopia-and-article-6-negotiations-in-sbesta-58/
118 https://www.undp.org/africa/blog/carbon-markets-africa-balancing-finance-mobilization-emission-reduction-goals

supply of electric energy, and flood protection. Considering the extensive efforts in reforestation and afforestation, along with the noticeable trend of increasing forest cover in Ethiopia, the country stands to benefit greatly. Ethiopia has the potential to generate an estimated amount of $50 million annually from carbon credit sales.

Ethiopia has also been implementing a Reducing Emissions from Deforestation and Forest Degradation (REDD+) initiative, a global initiative developed in Bali, Indonesia, in 2007 to address climate change mitigation through forestry initiatives mainly in developing countries. The forestry sector contributes 17 percent of the global GHG emissions. REDD+ is mainly a voluntary mechanism for climate change mitigation actions by developing countries. Ethiopia has been preparing the REDD+ readiness project. Ethiopia is currently in the second phase of the REDD+ initiative launched in 2023.

The GLI is part of Ethiopia's plan to mitigate climate change through the forestry sector. It is a significant reforestation campaign. In 2019, H.E. Dr. Abiy Ahmed has articulated a goal of planting 20 billion seedlings in four years. The initiative was launched in 2019 with an objective of planting 500 million trees across Ethiopia yearly. The initiative through the campaigns has a dual objective of creating awareness about climate change and environmental sustainability for the public while engaging in reforestation. Ethiopia has a target to generate $100 million from carbon trade by 2030.

The sustainability of the above efforts will require reducing biomass energy use, which in turn requires investment in green energy. The current energy mix of Ethiopia is dominated by traditional biomass (90 percent) which is not clean and environmentally friendly. Transforming this mix to green sources is crucial to sustaining achievements obtained in reforestation and forest restoration efforts. Unless clean energy becomes accessible to the vast rural population, the use of biomass for cooking and baking purposes will continue, counteracting the gains obtained in the forestry sector.

F. Loss and Damage Fund

Developing countries are disproportionately affected by loss and damage resulting from climate change induced natural disasters. Many developing countries are facing extreme weather, rising sea levels, and increasing desertification. The importance of addressing loss and damage challenges has been growing in recent COP discussions. The Loss and Damage Fund was established in 2022 at the 27th UN Climate Change Conference (COP27) to help low-income developing countries that are highly vulnerable to adverse impacts of climate change.[119] In the following conference (COP28) that was held in Dubai UAE, the parties decided to create and operationalize a fund that is particularly dedicated to address and compensate losses and damages incurred due to climate change. The concessional financing grant is the main financing mechanism that is used by the Loss and Damage Fund.

COP29 witnessed the official launch of the Loss and Damage Fund in November 2024, with a strong pledge by many countries to support it. The Fund was operationalized in Baku during COP29. The World Bank will house the Secretariat on an interim basis, and an Executive Director has been elected. The Fund has a legal status as an established financial intermediary fund, with the ability to collect contributions from the international community. There has not been a decision on the funding envelope. Pledges to the Fund by 18 countries and the European Union (plus two other countries) made at Abu Dhabi COP28 amounted to close to $700 million. Richer countries want the inclusion of loss and damage as a thematic focus of funding support in the new collective quantified goal on climate finance (NCQG) decided in Baku. All financial contributions are meant to be voluntary.

119 https://unfccc.int/loss-and-damage-fund-joint-interim-secretariat

Other challenges remain. It is not clear if certain emerging economies, such as China and India, will help capitalize the fund. Moreover, the allocation framework/eligibility and access criteria have not been defined, and there is not enough clarity on what constitutes loss and damage. Finally, many developing country advocacy groups want to ensure funding for communities, women and marginalized groups through devolving decision-making to locally led approaches and that issue has not been decided. Issues around recognition of cultural diversity and biodiversity have also been discussed. In conclusion, the Fund is off to a promising start, but setting eligibility criteria, definition of disbursement procedures, and ensuring rapid access to funding projects are still being considered.

G. Adaptation Finance

Climate change is increasingly hurting small communities and eroding livelihoods. Local communities in Ethiopian highlands are increasingly vulnerable to climate change and are experiencing a decrease in stream flows and groundwater levels. As water becomes scarce, lowland regions, especially Somali and Afar, are facing greater numbers of climate migrants**.** Drought and flood frequency are accelerating, and agricultural productivity is facing challenges in warm places. The resilience of local communities is becoming increasingly tested. A World Bank study finds that the largest impacts in the future are expected to be felt on labor productivity and livestock yields, and some regions – especially the lowlands – will be hit harder than others.[120]

There is also growing attention being paid both domestically and internationally to develop adaptation plans. Ethiopia has a National Adaptation Plan (NAP-ETH, 2019), and it has identified 18 adaptation options which guide the investment priorities. Most important are efforts to enhance food security, improve access to potable water, improve human health systems, increase ecosystem resilience, enhance sustainable forest management, and build social protection and livelihood options. The goal of this strategy was to strengthen holistic integration of climate change adaptation in Ethiopia's long-term development pathway. Moreover, the plan is to develop effective governance structures to support adaptation activities. Institutionally, there has been some progress. The government has centralized the approval procedure for public projects, entrusting it to the Ministry of Planning and Development (MoPD).

On the ground, the records of adaptation projects have been mixed, although there has been a paucity of strong evaluations. There has been increasing dissemination of early warning systems and agrometeorological information to local communities and improvements in agro-forestry practices. Safety nets for rural communities have improved, and there is some weather insurance for crops and access to credit. However, there is still not a strong pattern of change in rural communities and not a consistent agricultural planning amongst farmers in response to drought warnings. Flood mitigation efforts are sporadic across the country, and there has not been a surge in employment opportunities in the wake of climate finance. The data on livestock herders is inconsistent.

In terms of adaptation, Ethiopia faces several challenges. First, and most important, there has been inadequate financing for adaptation projects, both from domestic and international sources. In recent years, the recurring budget has grown substantially faster than the capital budget since last year, and little of the funding is going to adaptation projects. Second, there has not been a strong monitoring and evaluation framework. Third, there is a clear paucity of research analytics on the impacts of climate change, especially in terms of impact on specific regions, ecosystems, and communities. Fourth, there is not a strong capacity at regional and local levels to track projects. Finally, there is a lack for improved coordination and synergy of adaptation actions at both national and subnational levels.

120 World Bank (2024)

H. Other Sources of Finance

There are other sources of more Innovative financing involving nontraditional sources through solidarity, PPPs, and catalytic mechanisms.

- **The Mastercard Foundation,** in partnership with the government, the private sector, academic institutions, and young people, want to create decent jobs for 10 million young people in Ethiopia by 2030. One of the priority sectors for this initiative is agriculture and climate change strategies. Therefore, part of the $300 million can be accessed by creating youth employment in the forestry and renewable energy sectors.
- **Green tax.** It is a practice of exhaustively using local sources, such as imposing a carbon tax on the major emitters. For example, a certain margin can be added to the cost of tickets on Ethiopian Airline, and/or cross-country road transport services.[121] The revenue generated from such sources can be used for renewable energy projects. Ethiopian Airline alone can help generate at least $15 million annually if it charges only one $from each passenger.[122]
- **Voluntary contribution schemes.** Citizens and corporations in Ethiopia will have the option to contribute voluntarily to specific projects. Incentives such as financial guarantees, corporate social responsibility, and other rewards can also generate finance for forest conservation and renewable energy.

121 France recently introduced such tax (https://travelradar.aero/france-introduces-airline-tax-on-first-and-business-class-tickets/)

122 https://www.reuters.com/business/aerospace-defense/ethiopian-airlines-sees-30-surge-passengers-this-year-ceo-says-2024-05-01/

Ethiopia has considerable potential to marshal green finance for green energy. There can be significant increases in finance between 2024-2030 (Figure 11). Hydropower, geothermal, wind, and solar can be sources of green energy. Ethiopia can navigate the landscape of climate finance by focusing on vertical funds, together with multilateral and bilateral support. Innovative mechanisms, such as carbon credits, debt swaps, and green bonds, are other potential sources. The trifecta can generate more than $2 billion in climate finance by 2030. While the climate crisis will continue throughout the world, the financing possibilities are opening considerably. Ethiopia can seize the momentum and marshal these resources for its future sustainable growth path.

Ethiopia will have to find the way forward on climate finance. There are seven steps in the roadmap.

- Ethiopia's **energy mix** can continue to rely on hydropower as a baseload source of energy, with solar (to a large degree) and wind and geothermal (to a lesser degree) as intermittent sources (Annex Table 4 shows a pipeline of projects).
- Ethiopia should articulate **a policy framework** for climate finance, with key focus on expanding vertical funds, multilateral, bilateral, and private funding, and link these to priority national projects. Government should continue its successful strategy of securing concessional and non-concessional finance from bilateral sources for hydropower generation.
- It is important for Ethiopia to work on the **trifecta of green bonds, carbon credits, and debt swaps** as they can bring in additional finance for renewables. More than $2 billion can be mobilized by 2030. Germany, Italy, Sweden, and Denmark could be potential countries for swaps.
- Respective line ministries create a **pipeline of bankable projects** with feasibility studies.
- It is key to strengthen the **public-private partnership (PPP)** efforts to support the renewables sector and raise capital for investment. **Transactions advisers** can support the process.
- A **regular consultative forum** between the public sector and private investors is key.
- Government can strengthen the **CRGE forum** jointly chaired by MOF and MoPD that issues a policy paper, helps coordinate stakeholders, tracks climate finance, and advises government on financing strategies and bankable projects.

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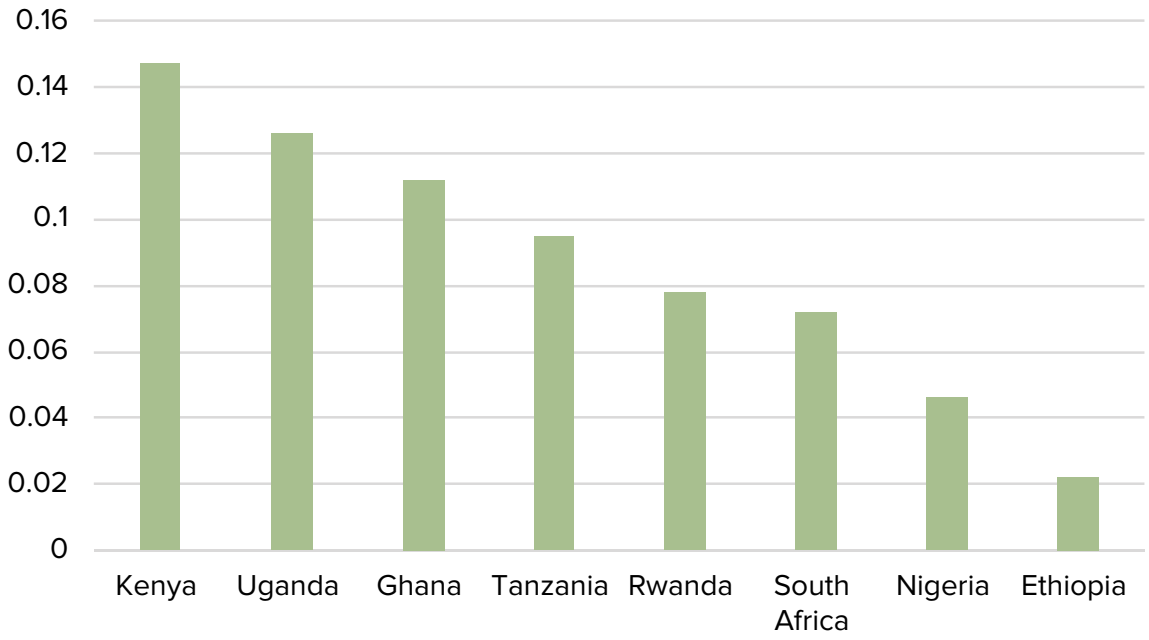
Annex 1: International Sources of Climate Finance in Ethiopia: Examples

Source/Fund	Previous projects or areas of focus	Instruments
Multilateral Climate Funds		
Global Environment Facility	> Promoting Sustainable Rural Energy Technologies (RETs) for Households > A Capacity Building Programme to comply with the Paris Agreement > Smart Farm: A data and digital technology driven farm and farm management solution for climate resilience. > Global Biodiversity Framework Early Action Support Project > Implementation of Cartagena Protocol on Biosafety > Climate Change Adaptation in the lowland ecosystems of Ethiopia > Enhancing Adaptive Capacity of Communities > National child project under the GEF Africa Minigrids Programme > Promotion of circular economy in the textile and garment sector through the sustainable management of chemicals and waste	Grant through LDCF and SCCF.
Green Climate fund	> Building Capacity to Facilitate the Integration of the National Adaptation Planning Process in Ethiopia > Responding to the Increasing Risk of Drought: Building Gender-Responsive Resilience of the Most Vulnerable Communities > Resilient Landscapes and Livelihoods Project	Grant and loans
Adaptation Fund	> Climate-Smart Integrated Rural Development Project > Agricultural Climate Resilience Enhancement Initiative	Grant
Multilateral Development Banks		
World Bank	> Renewable Energy Guarantees Programme Project (REGREP) > Climate Action Through Landscape Management Programme (CALM) > Climate Business Innovation Network	Grant and in-kind support
AfDB	> Tulu Moye Geothermal power plant (through the CTF). > Power interconnection between Ethiopia and Djibouti	Concessional loan/grants
Bilateral		
Germany (GIZ)	Renewable energy projects	
Norway	> Forest Programme and UNREDD > Ethiopia's Sustainable land management Programme > Climate-smart agriculture > Land rehabilitation (through the World Bank's BioCarbon Fund) > Energy-efficient cook stoves	
United Kingdom (DFID)	> Support the CRGE Facility in the promotion of climate-smart agriculture, forest protection and land rehabilitation. > Supported MOFEC to develop a climate finance tracking mechanism.	
United States of America (USAID)	> Power Africa – Energy sector > Advisory support on IPP projects, including contract drafting and the negotiation of Corbetti and Tulu Moye geothermal projects and the Metehara solar power project.	Risk guarantees and advisory supports
China	> Debt finance for renewable energy projects	Loans
Carbon Markets	> UNDP's Urban NAMA initiative > Ethiopian Airlines – potential source of carbon finance > MOFEC is in the process of introducing a carbon tax system for vehicle emissions.	

Source: Climate Finance Pathfinder (2020) and MoPD (2024) accessed at https://www.mopd.gov.et/media/climate-documents/25.7.24._GEFGCF_projects_profile_in_Ethiopia_WIleSLV.pdf

Annex 2: Average Electricity Tariff in Ethiopia (USD/KWH) 2023



Annex 3: Green Bond Principles (GBP)

Pillar 1. Use of Proceeds
> The proceeds from issuance of Green Bonds should be utilized to finance eligible green projects.
> All designated eligible green projects should provide clear environmental benefits, which will be assessed and, where feasible, quantified by the issuer.
> Eligible Green Bond projects include; renewable energy, energy efficiency, pollution prevention and control, sustainable natural resource use, biodiversity conservation, sustainable water and wastewater management, climate change adaptation, circular economy adapted products, green buildings
Pillar 2. Process for Project Evaluation and Selection
> **The issuer of a Green Bond should clearly communicate to investors:**
> The environmental sustainability objectives of the eligible green projects;
> The process by which the issuer determines how the projects fit within the eligible green projects categories; and
> Complementary information on processes by which the issuer identifies and manages perceived social and environmental risks associated with the relevant project(s).
Pillar 3. Management of Proceeds
> The net proceeds of the Green Bond, or an amount equal to these net proceeds, should be credited to a sub-account, moved to a sub-portfolio or otherwise tracked by the issuer in an appropriate manner, and attested to by the issuer in a formal internal process linked to the issuer's lending and investment operations for eligible Green Projects.
> It is recommended that an issuer's management of proceeds be supplemented by the use of an external auditor, or other third party, to verify the internal tracking method and the allocation of funds from the green bond proceeds
Pillar 4. Reporting
> Issuers should make, and keep, readily available up to date information on the use of proceeds to be renewed annually until full allocation, and on a timely basis in case of material developments.
> The annual report should include a list of the projects to which Green Bond proceeds have been allocated, as well as a brief description of the projects, the amounts allocated, and their expected impact.

Source: Based on ICMA (2021)

Annex 4: Priority Renewable Projects in Ethiopia

Name	Sector	Key features	Challenges	Financing Sources and Potential
Assela	Wind	Siemens Gamesa signed Ethiopia's first wind power project with Ethiopian Electric Power (EEP). The 100 MW Assela wind farm is about 150 km south of Addis Ababa and can support 500,000 households.	It has reached more than 50 percent completion status. Continuously delayed due to logistics and security issues. Land acquisition and compensation is complex.	Danish government providing EUR 170 million soft loan financial support via Danida Business Finance (DBF). Ethiopian Electric Power being trained to manage wind farms.
Aysha	Wind	A 390 MW onshore wind planned in Somali. AMEA POWER, a Dubai-based developer, signed an agreement with the MOF to build a large wind farm.	An 18,000-hectare wind farm project will require high investment costs and challenging logistics. It is partly operational.	Being developed by Dongfang Electric and Ethiopian Electric Power. Financing from Exim Bank of China and the GoE; AMEA Power (private sector player) Possible bilateral support from UAE.
Ashegoda	Wind	Commissioned in 2014, the first onshore wind project in the country, costing $200 million, consists of 84 turbines with a total installed capacity of 120 MW located in Tigray.	Did not generate electricity between 2020 and 2023 due to war, which damaged infrastructure.	Commercial and concessional loans Cofinanced by the AFD (EUR 45 million soft loan), BNP Paribas, and GOE. Vergnet and Alstom private French companies Possible PPP project that could be expanded.
Gad (Somali) and Dicheto (AFAR)	Solar	First PPP story: Saudi Arabia's ACWA Power awarded a contract to develop two photovoltaic (PV) solar projects with a combined capacity of 250 MW.	The GOE terminated the contract due to the slowness of the firm in getting funding. The company offered $2.5 cents/kWh, which did not materialize. The GOE will likely find a new developer.	Possible investment from private companies/ developers GCF and GEF Bilaterals PPP

Name	Sector	Key features	Challenges	Financing Sources and Potential
Masdar Ethiopia Solar PV Park	Solar	Agreement between the Government of Ethiopia and UAE state-owned firm Masdar to develop two solar plants and 500 MW of solar capacity.	Overly ambitious plan with strong support. Not operational yet.	Masdar and GOE PPP Possible UAE financial support.
Koysha Hydroelectric	Hydro	The Ministry of Water, Irrigation and Energy (MoWIE) has set ambitious targets; with 2160 MW, it is the second largest hydropower project in Ethiopia next to the GERD and under construction on the Omo River. Potentially transformative.	Project has had difficulty getting concessional loans as it is a transboundary project. Two thirds of the project have been completed. Inadequate cement supply and geopolitics have been among the major factors that caused the delay.	Non-concessional borrowing from Italian export credit guarantee agency SACE (IMF Programme caps non-concessional borrowing at $950 during four-year IMF Programme from 2024-2028) Potential for borrowing from non-traditional donors, including China. Domestic capital markets.
Birbir and Geba	Hydro	Two hydropower plant projects in southeastern Ethiopia expected to generate 564 MW (Birbir) and 371 MW (Geba) to support Ethiopia's energy transition.	Not started Challenges to find private sector or bilateral financiers High construction costs at time of lower govt capex.	Feasibility study financed by the AfDB More than one-fourth from the GOE Additional financing needed from bilaterals/PPP model Green bonds
Genale Dawa 5	Hydro	This project is a 100 MW hydro power project planned on Genale river/basin in Somali, Ethiopia. There are similar dam projects nearby The project is expected to be commissioned in 2025.	It will be important to find interesting parties Under consultant procurement for new feasibility studies.	Finance is secured for the feasibility study from the AfDB Green bonds

Name	Sector	Key features	Challenges	Financing Sources and Potential
Aluto Langano	Geothermal	Exploration started in Rift Valley about 200 km southeast of Addis. The production test of six geothermal wells with a capacity of 25 MW has been completed in 2023, but the plant is not operational so far.	Partially successful testing but requires upfront capital Security challenges Kenya Electricity Generating Company (KenGen) exited the project.	Kenya Electricity Generating Company AfDB provided $10 million through the Clean Technology Fund for the first phase. Financed by IDA and JICA More scope for bilateral donors and other developers.
Tulu Moye	Geothermal	Another geothermal source is based on their pre-feasibility studies. Can be Ethiopia's first independent power producer to operate at commercial scale.	Feasibility and exploration studies take time and upfront capital. Security issues Developer ran out of investment financing after unsuccessful drilling and inability to locate geothermal resource.	A JV between French investment firm Meridian SAS and the Icelandic Reykjavik Geothermal Limited Financial support from the Geothermal Risk Mitigation Facility for Eastern Africa, the African Development Bank (AfDB) and the US Trade and Development Agency.

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