

Green Industrialisation in Ethiopia

Challenges and Potentials on the Road to a Net Zero Green economy
Case Study

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Basic issues: discussion papers on development policies, international cooperation and south-north cultural exchange, as well as anti-racist campaigning.

The views expressed in this publication are those of the author, and not necessarily those of the editor/VIDC.

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ABBREVIATIONS

ADLI	– Agricultural Development-led Industrialisation
AGP	– Agricultural Growth Programme
BAU	– business as usual
CO₂e/ CO₂eq	– carbon dioxide equivalent
CRGE	– Climate Resilient Green Economy
EEPCo	– Ethiopian Electric Power Corporation
EIPDC	– Ethiopian Industrial Parks Development Corporation
EPRDF	– Ethiopian People’s Revolutionary Democratic Front
FDRE	– Federal Democratic Republic of Ethiopia
GERD	– Great Ethiopian Renaissance Dam
GHG	– greenhouse gas
GTP I	– First Growth and Transformational Plan
GTP II	– Second Growth and Transformation Plan
INDC	– Intended Nationally Determined Contribution
LDC	– Least Developed Country
LUCF	– land-use change and forestry
MEFCC	– Ministry of Environment, Forest and Climate Change
MOF	– Ministry of Finance
MoTI	– Ministry of Trade and Industry
MRV	– monitoring, reporting and verification
Mt	– million metric ton
NAMA	– Nationally Appropriate Mitigation Action
NDC	– Nationally Determined Contribution
ODI	– Overseas Development Institute
PASDEP	– Plan for Accelerated and Sustained Development to End Poverty
PSNP	– Productive Safety Net Program
SLMP	– Sustainable Land Management Project
TJ	– Renewable energy consumption
TWh	– Terawatt-hour
UNFCCC	– United Nations Framework Convention on Climate Change
VSK	– Vertical Shaft Kiln

1. INTRODUCTION

Ethiopia's increasing industrial activity and investments in infrastructure and manufacturing have made the country one of the fastest-growing economies on the continent. With such fast socio-economic growth, sustainable development and transition to a low carbon economy become a headline. Ethiopia has taken significant moves toward sustainable development, with the 2011 ambitious Climate Resilient Green Economy (CRGE) strategy serving as a noteworthy example of such efforts.

According to the United Nations, Ethiopia is classified as a Least Developed Country (LDC), which is defined by a low level of income and structural barriers to progress, as well as the need for specific measures to address such issues. (UN DESA, 2021) Ethiopia's historical and present contribution to global greenhouse gas emissions is minimal, but the efforts taken so far demonstrate the country's commitment to long-term development.

The Ethiopian government submitted its First Intended Nationally Determined Contribution (FDRE, 2015a) to the United Nations in 2015, in the run-up to the Paris climate summit and revised its NDC (FDRE, 2021a) ahead of the 26th Conference of Parties in 2021. It is based on the country's national goal of developing a Climate-Resilient Green Economy (CRGE). Ethiopia ratified the Paris Agreement in 2017.

While the objective reason for the development of CRGE was the constitutional interest to move towards sustainable development, the context at the time provides some political-economic explanation why the path that led to the CRGE strategy was chosen. The country, during the development of the CRGE, was passing through recurring droughts and the inflation rate was rocketing. Projections and economic assessments indicated that with a business-as-usual way of development, the country would likely end up racking more international debts and will be left with a dominantly social protection reliant community. Informal sources also note that the previous Prime Minister was briefed on climate change ahead of the Copenhagen climate negotiations that led to the visibility of Ethiopia as a least developed African country with much greater involvement in the international negotiations and readiness for climate action. This triggered inter-

est in development partners to addressing climate change problems in Ethiopia in a more coordinated and streamlined manner. That reportedly led to the Ethiopian Development and Research Institute (EDRI), under the direct guidance of the Prime Minister, to lead the development of the CRGE strategy. Because adaptation conversations had not advanced during that time, CRGE was dominantly mitigation focused.

Meanwhile, the government has initiated numerous big climate-change-related programmes at the national level, with great mitigation and adaptation potential. The Addis Ababa Light Rail Network, for example, has been brought as a public transit alternative to the growing use of motorised vehicles in the capital city Addis, making it a pioneer in urban mobility.

According to Ethiopia's Green Legacy project, the government planted around four billion trees in 2019, including a record-breaking 350 million on a single day in July, as part of the year-long initiative. (Corey-Boulet, 2020) Ethiopia, rather than relying heavily on fossil fuels to fulfil rising energy demand, has continued to enhance its renewable energy access and producing capacity. As part of the national efforts to protect its development gains from climate change threats, the country has implemented large-scale initiatives such as the Productive Safety Net Programme (PSNP), the Agricultural Growth Programme (AGP), the Sustainable Land Management Programme (SLMP), and the Great Ethiopian Renaissance Dam (GERD).

This is particularly noteworthy because Ethiopia's efforts to combat climate change and promote green growth are not restricted to a few specific industries. The commitment extends beyond the usual climate-related industries and encompasses the whole economy, with representatives from all main sectors of the economy participating in climate change response efforts. Climate change was mainstreamed into the country's broad development planning framework, particularly through the second Growth and Transformation Plan (GTP II). Building on GTP II and its predecessor GTP I, a new 10-year development plan is now designed to navigate the country to prosperity. In practice, Ethiopia has accomplished, and continues to do, a great deal in the fight against climate change.

This case study presents a succinct assessment of the national effort, in analysing obstacles and possibilities associated with the transition to a low carbon, environmentally friendly economic system, with a focus on industrialisation and climate change response. In doing so, this research hopes to get a better understanding of the governance and institutional structure that served as the foundation for the transition to a low carbon, environmentally friendly economy. The research will also look at the potential and difficulties that Ethiopia still faces in its effort to raise its climate ambition even higher and ensure a more seamless transition. This case study focuses heavily on a desk examination of existing publications, policy papers, and analyses.

It is divided into five major sections, each of which is discussed below. Section 1 seeks to provide a high-level overview of Ethiopia's climate backdrop, government, policies, plans, and international obligations, all in a concise manner. Section 2 goes on to examine industrialisation in Ethiopia, followed by section 3 which looks at the efforts being made to transition to a low carbon economy. Section 4 seeks to bring the case study to a close by highlighting problems and opportunities followed by drawing conclusions in section 5.

I. Country Profile

Ethiopia is a landlocked country in the Horn of Africa, bordering Eritrea, Somalia, Kenya, Djibouti, South Sudan, and Sudan. Ethiopia has around 1.104 million square kilometres in total (440,284 square miles). (Invest Ethiopia, 2021) High plateaus and mountains dominate the landscape of the nation. Ethiopia's altitude ranges from more than 100 metres below sea level to over 4600 metres above sea level (i.e. the Dashen Mountains) (Invest Ethiopia, 2021). The climate of the nation is greatly influenced by variations in altitude. Geographical differences in Ethiopia's climate are reflected in the country's topography. Lowlands in the southeast and northeast have average temperatures of 25-30°C, whereas the central highlands (above 1500 metres in height, comprising around 45% of the country's landmass) have average temperatures of 15-20°C. The Danakil Depression, at 126 metres below sea level, is Ethiopia's lowest point, while Ras Dashen, at 4562 metres above sea level, is the country's highest point. (Berhane et al., 2020)

Ethiopia has experienced climatic changes with recurring droughts impacting the people and economy.

Climate change has exacerbated droughts, and desertification in the lowlands of the country is expanding. (Eshetu et al., 2014) A World Bank future forecast indicates that median temperature rise could reach 1.14°C from 2020-2039 with a business-as-usual scenario (World Bank, 2021).

Ethiopia is endowed with various natural resources. The resources are, however, affected by continuous malpractices and natural catastrophes. Land degradation is one of the biggest challenges of the country. The problem ranges from land degradation, due to deforestation and soil erosion, to environmental pollution, ensuing from the unwise use of a wide variety of chemicals for agriculture, domestic purposes, or the manufacturing of industrial products with steadily growing devastating effects on the environment and public health. The impact of soil erosion is considerable, particularly in the highlands of the country. It has led to the loss of nutrients in agricultural farmlands which in turn become the reason for decreased agricultural outputs and hence food insecurity. It is also the major reason for the damage of water bodies like lakes through siltation.

Ethiopia is rich in biodiversity. However, it has been affected by several factors such as the introduction of invasive alien species; settlement and investment activities that do not take into account environmental concerns; inappropriate use of natural resources; the continuous increase in the amount of toxic waste and other pollutants; a low awareness level of the public regarding the value of biodiversity; high degradation of forests, vegetation cover and water & soil resources; the impact of widespread poverty in the country; and the recurring drought and desertification. Ethiopia is also often known for its vast water resources that could be applicable for various economic and social purposes. However, the resource is not presently being used to the desired extent.

Ethiopia is not an industrialized country. But despite the limited numbers of factories in the country, their impact in terms of pollution is high. A great majority of these industries discharge their waste in the form of liquid, dust particles and smoke, without any treatment into nearby water bodies and open spaces. (Tenaw, 2021)

Climate change would impact women and girls more because of their distinct roles particularly around energy and water. (Lalisa, 2022) Culturally, water is mostly collected by women and girls for drinking, cooking,

washing, hygiene, and rearing small livestock. A study that looked at whether climate variability affects men- and women-headed households differently in Ethiopia, found that female-headed households are more exposed to the effects of climate change than male-headed households, with their income falling by 12.4 percent as a result of climate variability, compared to 5.7 percent for men. (Wossen, 2016)

II. Constitution

The current Federal Democratic Republic of Ethiopia (FDRE) constitution, which came into force in 1995, is the supreme law of the land. (FDRE, 1995: art. 9) Even though it does not directly address industrialisation, the FDRE constitution in many ways represents a significant departure from the past three constitutions in regard to sustainable development. One notable element is that it has explicitly included provisions relevant to the protection, sustainable use, and improvement of the country's environment. Article 43 of the FDRE enshrines the right of development, including sustainable development, Article 44 follows with the environmental rights.

In addition, Articles 89 and 92 of the FDRE constitution mandate that national policy and government operations have to be consistent with environmental health to be effective. The government is obligated under Article 89 of the FDRE constitution to ensure sustainable development, strive for the common good of

the community, and encourage the involvement of the general public, especially women, in the formulation of national development policies and programmes. Furthermore, Article 91 of the FDRE Constitution states that the government has a responsibility to safeguard and nurture cultures, traditions, natural resources, historical places, and other cultural and historical assets. By including these significant elements in the supreme law of the nation, environmental problems have now been elevated to the same level as fundamental human rights.

The Constitution envisages public ownership of land and all-natural resources. Article 40(3), in particular, reads *“the right to ownership of rural and urban land, as well as of all-natural resources, is exclusively vested in the state and the public”*. Article 51(5) of the Constitution provides that the federal government has the power to *“enact laws for the utilization and conservation of land and other natural resources (...)”*. According to Article 52 (2), regional states have the power of administering land and other natural resources in accordance with the federal laws. The realisation of these rights and responsibilities requires efficient implementation mechanisms such as laws, policies, and institutions.

III. Governance

In Ethiopia, government powers and functions are constitutionally divided between the federal and regional governments. The federal government is supposed to

FDRE Constitution Article 43: The Right to Development

1. The Peoples of Ethiopia as a whole, and each Nation, Nationality and People in Ethiopia, in particular, have the right to improved living standards and sustainable development.
2. Nationals have the right to participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community.
3. All international agreements and relations concluded, established, or conducted by the State shall protect and ensure Ethiopia's right to sustainable development.
4. The basic aim of development activities shall be to enhance the capacity of citizens for development and to meet their basic needs.

FDRE Constitution Article 44: Environmental Rights

1. All persons have the right to a clean and healthy environment.
2. All persons who have been displaced or whose livelihoods have been adversely affected as a result of State programmes have the right to commensurate monetary or alternative means of compensation, including relocation with adequate State assistance.

Source: FDRE, 1995



have an exhaustively enumerated set of functions and powers, without losing the possibility of these powers to increase by the decision of the House of Federation. Regional states have residual power; anything that is not given to the federal government alone, or the federal government and regional states, concurrently is left to regions.

The primary responsibility in the management of natural resources rests with the federal government. The federal government discharges its responsibility by enacting the basic legislative framework. Regional states are empowered to administer natural resources in their respective territories in accordance with federal laws. When it comes to water, in addition to providing the basic legislative framework for the management of water resources, the federal government also has the power to *“determine and administer the utilization of waters or rivers and lakes linking two or more states or crossing the boundaries of the national territorial jurisdiction”*. (FDRE, 1995: art. 51.11)

The role of regional states can be said to be restricted to that of administering natural resources based on federal laws. The power of administering natural resources might include the power to enact legislation. However, regional states cannot make laws that contradict federal laws on natural resources.

The role of states to administer water resources is, however, limited concerning water resources that link or cross two or more states, because of the clause in the Constitution gives such power, to the federal government. Major water bodies of the country link or cross two or more states (in fact most of them are international rivers) and hence the administration of such water bodies is the responsibility of the federal government. No major river is found within the exclusive territory of one state; almost all major rivers except Awash are international, a fact which further augments the powers of the federal government.

2. INDUSTRIALISATION IN ETHIOPIA: THE BATTLE AGAINST POVERTY

Over the past decade, Ethiopia has emerged as one of the fastest-growing economies in Africa. Ethiopia's economy relies primarily on agriculture, which serves as the primary source of employment, foreign exchange earnings, and food security for the great majority of the country's people. National economic growth is primarily driven by public investments in infrastructure and the enhancement of productivity, particularly in the agricultural sector, rather than by private investments. Like in many other developing nations, the agricultural sector will determine whether or not Ethiopia achieves food and nutritional security, as well as economic success for the whole country. However, the performance of agriculture was not sufficient, because poverty continues to be a significant component of the country's international standing. In this regard, the absence of adequate policies and plans was cited as the most important cause for the sector's stagnation in recent years. In 1994, the government developed the Agricultural Development Led Industrialisation (ADLI) National Development Strategy to address this issue and stimulate growth in agriculture so that it may act as an engine for the sector and the entire economy

as a whole. (Dube et al., 2019) ADLI aimed to trigger a self-supportive reform of farm and industry, but its fundamental objective was to eliminate poverty and gradually increase the share of industry in the national gross domestic product (GDP). To achieve its goals of converting the country from an economy dominated by the farm sector to an economy dominated by the industrial sector, the strategy was also accompanied by strategies and plans including:

- Industrial Development Strategy in 2002
- Sustainable Development and Poverty Reduction Program (SDPRP), 2002/03-2004/05
- Plan for Accelerated and Sustained Development to End Poverty (PASDEP I), 2005/06-2009/10
- Growth and Transformation Plan I (GTP I), 2010/11-2014/15
- Ethiopia's Industry Development Strategic Plan (2013-2025)
- Growth and Transformation Plan II (GTP II), 2014/15-2019/20
- Green Manufacturing Strategy 2019
- Ethiopian Cement Industry Development Strategy 2015-2025

Ethiopian Industrial Policy and Development Phase (Gebreeyesus, 2021)			
	Imperial Period Pre-1974	Derg Regime 1975-91	EPRDF Regime Post-1992
Guiding Policy/ Vision	Market-oriented	command economy	Market-oriented
Leadership/ Ownership	private-led	state-led	private-led but also strong state role
Target Industries	dominance of foreign-owned enterprises	dominance of publicly owned enterprises	dominance of domestic privately owned enterprises
Policy Instruments	Labour-substituting and labour-intensive industries (textile, food, cement)	Import-substituting and labour-intensive industries and basic industries	export-oriented and labour-intensive industries (e.g., textile, leather, agro-processing, cement)
Governance Role	infrastructure and human resource development, and ownership of selective industries	mainly government ownership	infrastructure and human resources development, ownership of selective industries and capacity building of the private sector

Major political turnovers in the country brought policies and direction towards industrialisation. What was rather a privately owned and led industrial sector during the imperial period, was completely turned to state-led ownership during the Derg regime. After the end of the Derg regime, the Ethiopian People's Revolutionary Democratic Front (EPRDF) led a mixed-market economy with the government strongly supporting the private sector.

To meet growing demand and support the ongoing development efforts, the country has initiated economic infrastructure megaprojects. Accordingly, huge investments have been made in energy (hydro and wind electric power generation, substation, transmission, and distribution), transport (road, railway and air) and telecommunication projects.

I. Development Plans

Ethiopia used to have development plans for a maximum duration of five years. Currently a Ten-Year Development Plan "Ethiopia: An African Beacon of Prosperity" which will run from 2020/21 to 2029/30 has been put in place, in line with the country's homegrown economic reform agenda. The Ten-Year Plan has considered the strengths and weaknesses of previous plans, the nation's vision for 2030, national policies and strategies, and the commitment to the global Sustainable Development Goals. The previous Growth and Transformation Plans (GTP I and II) have achieved higher growth

and investment targets than those of any of Ethiopia's earlier national plans such as the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) and the implementation of GTP I and II required faster growth in total factor productivity as well as large-scale mobilization of domestic and foreign savings.

The vision 2030, as stated in the Ten-Year development plan, aims for prosperity to ensure material needs, dignity, equality and freedom (FDRE, 2021b)

This includes

1. physical, human, and institutional capital for income generation and asset accumulation;
2. equitable access to education, health, and other services for improved utilization of potentials and assets creation;
3. unconditional access to the necessities of life, food, shelter, clean water, basic health, and education;
4. economic, social, and political participation without ethnic, religious, demographic, and gender discrimination; and
5. an overall affirmative system built on consensus.

II. Strategies to Promote Industrialisation

Ethiopia's industrial sector has been growing steadily for over a decade. This is attributed to the policies and implementation undertaken over the past decades, as

National Average Growth Rate in GDP by major economic sectors, in %			
	2010-2015	2016-2020	2010-2020 (average)
Agriculture	6.6	4.1	5.3
Crop	7.5	4.8	6.1
Livestock	5	2.5	3.7
Industry	19.1	15.2	17.2
Manufacturing	15.1	13.0	14.1
Construction	27.7	17.3	22.5
Service	11.1	8.2	9.7
Wholesale and Retail Trade	11.7	8.9	10.3
Transport and Communication	13.0	11.5	12.2
Finance Industry	11.4	12.5	11.9
Growth Domestic Product	10.1	8.2	9.2

well as increasing international and domestic investments. The 2002 industrial strategy aimed to operationalize ADLI, focusing on export and expansion of labour-intensive industries.

In supporting the government's plan for Ethiopia to become a middle-income country by 2025, GTP I set growth rates for the time between 2010-2015. For the GDP to increase by more than 10% per annum, exports should grow from 14% of GDP to 23%, and the domestic savings rate from 5.5% to 16%. To achieve these targets, the development of the industrial sector was identified to be crucial. The industrial sector was projected to grow at a rate of 20% per annum, or twice the annual increase achieved over the period between 2005 and 2010. The sector's share of GDP was expected to rise from 13% to 19% within five years (2010-2015). To achieve this specific target, the GTP acknowledged that light manufacturing would have to be scaled-up. These expected growth rates need to be sustained for 15 years, if the middle-income country status is to be achieved by 2025. In 2025, the industry is expected to contribute 32% to the GDP, with services 39% and agriculture 29%. (FDRE, 2011)

Industry's average annual contribution to GDP grew far faster than services' (11.3% vs. 0.8%) between 2011/12 and 2015/16), while agriculture's part of GDP fell at a pace of 3.7% each year. In 2015/16, the industry provided 16.7% of GDP, a significant increase from the 11.5% contribution in 2011/12. According to GTP II, the manufacturing sector contributed 4.8% to GDP in 2014/15, and its share was expected to rise to 8% by 2019/20. In 2014/15, the industry grew at a pace of 23.5%, and it was predicted to increase at a rate of 20% in 2019/20. The manufacturing subsector grew at a pace of 21.4% in 2014/15 and was expected to grow at a rate of 21.9% by 2019/20, in line with industrial growth. (FDRE, 2019)

Notably, industrial parks which potentially can contribute significantly to the industrial growth rate, are currently booming in Ethiopia. From 2012 up to 2014 industrial parks had been developed and regulated by the Ministry of Industry. The Ethiopian Industrial Parks Development Corporation (EIPDC), established as a Public Enterprise under the Council of Ministers Regulation No.326/2014, is mandated to develop and administer industrial parks. Industry parks aim at attracting investors through incentives, including income tax, customs duties and other tax and non-tax exemptions

as well as an easy access to the industrial park space. (EIC, 2017). The industrial parks are developed near airports, railway lines, dry ports, universities and other vital economic corridors, and are connected to ports, allowing for large-scale employment creation and easing technological transfers. The Ministry of Trade and Industry (MoTI), in collaboration with the EIPDC, is driving the country's industrialisation in line with the GTPs, which envision the industrial sector playing a major role in the economy. Regional governments and other private industrial park developers are also contributing significantly to the country's industrialisation. (FDRE, 2019) According to the IPDC, Ethiopia has generated 610 million USD from the 13 industrial parks, creating job opportunities for more than 89,000 Ethiopians. (Fana, 2021)

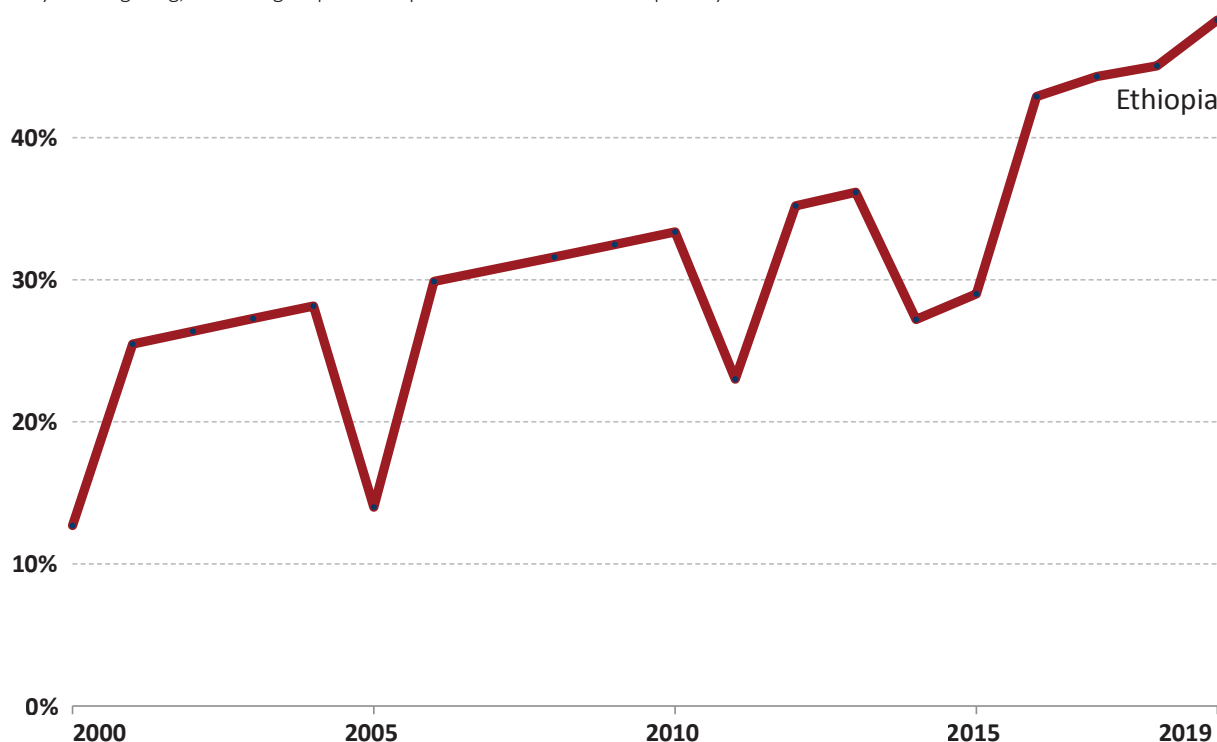
Another focus area identified in GTP II is the plan to accelerate industrialisation and increase access to infrastructure through improving the capacity of the construction sector. In this regard, the role of the cement industry has been instrumental to ensure that supply-demand was met for the booming development and construction. To ensure that increasing demand is met by adequate supply, the Ministry of Industry developed the Ethiopian Cement Industry Development Strategy 2015-2025. (Ministry of Industry, 2015) Ethiopia currently has around 23 cement plants with a few large and a majority of smaller cement firms in the mix. (Global Cement Report, 2021) Larger cement companies, which have better technology (e.g. vertical rotary kiln), better materials handling practises, better quality control practises, better health and safety practises, better product quality, more efficient energy consumption, a higher installed capacity and a higher level of automation, (primarily in newer lines). Smaller cement companies do not have these technologies or systems. They employ a VSK (Vertical Shaft Kiln) technology, which requires less space, cheaper initial investment and needs less time to set up than traditional kilns. (Ministry of Industry, 2015)

III. Energy as a Building Block to Industrialisation

The term "stranded assets" has become an increasingly hot topic in the international climate talks. Stranded assets are assets that are worth less than expected. If the demand for fossil fuels shrinks, due to a global tran-

Electricity access

Share of the population with access to electricity. The definition used in international statistics adopts a very low cutoff for what it means to 'have access to electricity'. It is defined as having an electricity source that can provide very basic lighting, and charge a phone or power a radio for 4 hours per day.



Source: Hannah Ritchie & Max Roser, 2021. Published in Our World in Data, ourworldindata.org/energy

sition to a low carbon economy, this will affect income and economies of countries who rely heavily on fossil fuel exports. Depending on a country's resource dependency (particularly fossil fuel) and socio-economic development, transitioning to a low carbon economy will therefore have equality, fairness, vulnerability, and justice implications. (Denton et al., 2021) Thus, for a least developed country like Ethiopia, taking climate actions is not only about a moral and just cause but also a motivation to shift towards sustainable development. Additionally, the possible social, economic, and environmental return that could come from a sustainable development pathway garnered interest from the government to shift from a business-as-usual to a "green" industrialisation pathway. This argument holds weight because Ethiopia's response to climate change has been proactive and came before any obligations

under international agreements. For example, Ethiopia stopped fossil fuel subsidies in 2008, long before subsidy abolition discussions started. The same is true for setting up a climate strategy- a year ahead of the international agreement on Intended Nationally Determined Contributions (INDCs).

As indicated in the figure below, the electrification rate and the access to electricity remain significantly low in Ethiopia. The availability, accessibility and affordability of energy is always a pre-requirement towards implementing the above-mentioned national strategies and plans.

This begs the question as to why access to electricity remains low while studies show the natural gas potential of the country. (Hailu/Kumsa, 2020) Electricity generation comes majorly from renewable energy sources - the option chosen by the government to meet the

National Energy Potential					
No.	Source	Unit	Exploitable potential	Exploited amount	Percentage exploited (%)
1	Hydropower	GW	45	3.18	~17
2	Solar (day)	kWh/m ²	5.2		< 1
3	Wind	GW m/s	1350	0.324	< 1
4	Geothermal	GW	7	0.0073	< 1
5	Wood	Million Ton	1120	560	50
6	Agricultural waste	Million Ton	15–20	~6	30
7	Biogas	Household	1–3 million	17869	< 1

Source: Beyene et al., 2018

fast-increasing electricity demand. This is because of, as indicated in the table below, the vast national renewable energy resources available and their potential to meet the current and future energy demand of the country. (Hailu/Kumsa, 2020) Particularly with Africa's largest 4 billion USD mega hydropower Great Ethiopi-

an Renaissance Dam- expected to hold 63 billion cubic meters of water and generate 6,450 MW of electricity - the government not only aims to meet some of the national energy demand but also to generate foreign currency income through energy sales to neighbouring countries. (Josephs, 2018)

3. NATIONAL EFFORTS TOWARDS GREENING THE ECONOMY AND SUSTAINABLE DEVELOPMENT

What the industrial revolution has taught the world is that prosperity in the global north came at the cost of the environment. Evidence shows that the industrial revolution contributed significantly to global warming. (Gosh, 2021) Thus developing countries like Ethiopia are at a key juncture as they lay their industrialisation foundation. Decisions have to be made to plan and act to meet the needs of the present, without compromising the ability of future generations to meet their own needs. To this effect, Ethiopia has been taken some bold steps towards sustainable development. This section will look at the CRGE and NDC as the key drivers to Ethiopia's approach to tipping the balance.

1. Climate Resilient Green Economy (CRGE)

Ethiopia is classified as a least developed country (LDC) challenged by poverty, human resource weakness and economic vulnerability. (UN DESA, 2021) Similar to other LDCs, Ethiopia has one of the lowest historical and annual GHG emissions.

Even with its vulnerabilities and challenges, Ethiopia was considered bold, ambitious and exemplary, when in 2011, on the margins of the Durban climate conference, the country unveiled its vision of developing a climate-resilient green economy (CRGE) by 2025. Since then, Ethiopia experienced several political and policy developments. Among others, it is now under its third Prime Minister since the public announcement of building the CRGE. The strategy has seen major political traction in the country, with an Inter-Ministerial Steering Committee (made up of relevant ministries) coordinating the CRGE. (FDRE, 2011)

The 10-year development plan (2020/2021-2029/2030) has been informed by the key national climate strategy of the country. The Climate Resilient Green Economy Strategy (CRGE) is a vision to build a middle-income climate-resilient green economy by 2025 through net-zero carbon growth. At the time, Ethiopia was emitting 150 Mt CO₂ annually. If the gov-

ernment took the business-as-usual development trajectory, the annual emission of greenhouse gases would have reached 400 Mt by 2030. But through the CRGE strategy, the aim is to remain at a similar annual level of emissions. Even after the economy has been steadily growing for many years, the annual emission rate is minimal.

Nearly 150 initiatives and programmes were identified throughout the process of formulating the plan. Using four criteria, around 60 of these were chosen from the agriculture, forestry, power, transport, and industry sectors. These criteria were the project's contribution to economic growth and transformation as well as its contribution to reducing emissions and the costs associated with reducing greenhouse gas emissions.

The green economy plan is based on four pillars (FDRE, 2011):

- Improving crop and livestock production practices for higher food security and farmer income while reducing emissions.
- Protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks.
- Expanding electricity generation from renewable sources of energy for domestic and regional markets.
- Leapfrogging to modern and energy-efficient technologies in transport, industrial sectors, and buildings.

This strategy has not been left national, it has also translated to one of the global commitments Ethiopia took in ratifying the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the Paris Agreement. Global goals can only be met when countries translate them into their national policies and strategies. Ethiopia has been striving to create a better linkage with global objectives. In addition to



the CRGE, Ethiopia also submitted its NAMAs (Nationally Appropriate Mitigation Actions) to the UNFCCC in January 2010. NAMAs are climate policies and measures of countries, targeted at different economic sectors. Ethiopia has also made a NAMA recognition project submission on the transport sector. (FDRE, 2015b) The Light Rail Transit (LRT) system project in Addis Ababa was submitted for recognition, showing a modal shift of freight transport from road to an electric rail network powered through renewable energy. This was not only a national flagship project but a lesson to share with LDC member countries that it's possible to leapfrog to better and efficient technology.

The CRGE Fast Track Investments were designed to accelerate the pace of implementing agencies in mainstreaming and implementing the CRGE. (FCDO, 2017) This fast-track investment was funded by the UK government and the Austrian Development Agency, and was led by the CRGE unit within the different sectors. The Ethiopian Ministry of Finance took the lead in organizing the CRGE units and managing the funds. In January 2014, 23 Fast Track Investments (further elaborated below) that had been prepared by different ministries, were submitted to the CRGE Advisory Committee. The Committee evaluated the proposals against a set of evaluation criteria and their connection with government policies and objectives.

Institutional Setup

One of the most notable outcomes of the CRGE strategy is the establishment of units in all government ministries, including the Ministry of Trade and Industry, and the appointment of focal individuals in institutions under each ministry to oversee CO₂ emission-reduction operations, such as planning and monitoring. (FDRE, 2019) Each CRGE Unit is expected to submit quarterly progress reports, annual progress reports, as well as annual monitoring, reporting and verification (MRV) reports to the CRGE Facility. For instance, the Ministry of Trade and Industry is represented on both the CRGE Inter-Ministerial Steering Committee and the CRGE Management Committee, with Ministry representatives attending both committees' half-yearly (annual and interim) review meetings. (FDRE, 2020)

Ethiopia undertook an independent review of the impact of CRGE to take stock of progress and assess performance as well as inform the 10 years development plan. (FDRE, 2020) The section below will summarize the emission potentials, intervention plans and

achievements of the industry, power, and transport sectors in the CRGE.

Industry Sector

As stated in the CRGE, more than 85% of Ethiopia's emission of 150 Mt CO₂e in 2010 came from the agricultural and forestry sectors, followed by power, transport, industry and buildings, which contributed 3% each. Out of the 4 Mt CO₂e emissions from the industry sector, about 50% is from the cement industry, making it the largest industrial source of emission. It is followed by mining (32%) and the textile and leather industry (17%). The rest of less than 2% of emissions come from steel, other types of engineering, the chemical industry (including fertiliser), the pulp and paper industry and food processing. (FDRE, 2011)

In absolute terms, the highest increase of emissions from 2010 to 2030 is expected from the agriculture sector - 110 Mt CO₂e, followed by industry at 65 Mt, and forestry at 35 Mt. In relative terms, emissions from the industrial sector are expected to increase by more than 15%, and from transport by around 11%. The industry sector which is emission intense shows the highest emission growth, with the expectation that industries grow at annual rates of up to 20%. Cement production was projected to increase from 2.7 Mt in 2010 to 27 Mt in 2015 and to more than 65 Mt in 2030. This is due to the reason that some cement factories use outdated, energy-inefficient technologies. The overall industrial emissions are projected to increase by 16% per annum, from 4 Mt CO₂e to 71 Mt in 2030. (FDRE, 2011)

A total gross abatement potential of 22 Mt CO₂e by 2030 can be achieved by implementing abatement measures such as energy efficiency, alternative fuels, alternative production processes and other measures, with the cement industry accounting for the majority of the potential reduction, with a reduction of 16 Mt CO₂e. (FDRE, 2011)

The CRGE identified a series of initiatives to increase the competitiveness of the cement industry by reducing production costs and bringing significant environmental and health benefits:

- Improved energy efficiency by converting the technology used and by introducing computerized energy management and control systems, that could decrease energy demand, cost, and emissions from cement production - an estimated reduction of up to 6 Mt CO₂e in 2030.

- Substitution of clinker by increasing the pumice content leading to a decrease in both variable production costs and emissions- an estimated reduction of up to 5 Mt CO₂e.
- Increased share of biomass in the mix of energy for production in cement factories, potentially decreasing costs, and emissions- an estimated reduction of 4 Mt CO₂e

Other sub-sectors of industry such as the textile, leather and fertilizer industries were identified as important elements of the economic development models with a plan to promote energy-efficient and alternative fuel usage for these sectors. Other initiatives were also identified for the steel, chemicals and mining sub-sectors (FDRE, 2011).

The Ministry of Industry has been implementing CRGE through funds for two CRGE Fast Track Investment (FTI) projects (FDRE, 2020)

- Greening of the Bole-Lemmi Industrial Zone - which developed 32.9 hectares of green space that benefited 790 jobless youth (450 females and 290 males) through employment opportunities and upscaling, reduced air, and noise pollution.
- Development of a baseline for GHG emissions and an MRV system for the industry sector- to strengthen energy efficiency measures in industries. Energy audits were conducted in the cement, textile, and leather sub-sectors showcasing progress.

Putting in place the technical capacity and administrative tools needed to adopt multiple MRV protocols was recommended in an industry sector MRV system report. Despite the publication of the report and the completion of multiple industrial energy audits, no further effort has been reported to put the report's recommendations into action and to adopt energy-saving measures. This is primarily due to a lack of financing as well as technical implementation capacity.

Power Sector

The electric power sector emits very little because it is mostly reliant on renewable energy, with hydropower accounting for more than 90% of total power generation capacity, supplemented by on- and off-grid diesel generators managed by the Ethiopian Electric Power Corporation (EEPCo). The energy sector's emissions were less than 5 Mt CO₂e or around 3% of the country's overall emissions at the time the CRGE was designed. In the BAU scenario, emissions are expected to remain below 5 Mt CO₂e. Total electricity demand is expected to increase from 4 TWh in 2010 to more than 75 TWh in 2030. According to EEPCo's master plan, diesel power plants and off-grid generators would be shut down between 2012 and 2014, and power would be generated solely from clean or renewable sources starting in 2015. The only residual emissions were expected to come from residential off-grid fossil fuel generation in rural areas. (FDRE, 2011)

Expanding electric power supply at a rate of more than 14% per year is needed to support economic development at a rate of more than 10% per year, as the government intends. Ethiopia has adequate natural resources to meet this demand, especially by utilizing its huge potential for hydro, geothermal, solar, and wind energy, all of which provide electricity with nearly zero GHG emissions. The predicted power supply could even exceed the expanding domestic demand if properly captured: although demand is expected to be approximately 70 TWh in 2030, energy efficiency initiatives can reduce demand by 19 TWh. As a result, increasing supply while also enhancing energy efficiency opens the option of exporting clean energy to neighbouring countries (up to 28 TWh). Electric power generated from fossil fuels could be replaced, resulting in a reduction of almost 20 Mt CO₂e in GHG emissions in addition to the planned reduction of 250 Mt CO₂e identified in other sectors. (FDRE, 2011)

Transport Sector

Road transport, primarily freight and construction vehicles, and to a lesser extent private passenger vehicles, account for 75% of all emissions in the transportation sector. Air travel also has a substantial contribution (23% of transport-related emissions). Inland water transport emits very little. Transportation emissions are expected to increase from roughly 5 Mt CO₂e in 2010 to around 40 Mt CO₂e in 2030. Higher emissions from

The 2019 'Environment, Forest and Climate Change Commission Performance Contract in Ethiopia' report of the CRGE presents an overview of the nature and scale of electricity expansion in recent years (FDRE, 2020):

- An additional 2,124 MW of hydropower has been developed (*Gilgel Gibe III, Genale Dawa III*), with a further 2,800 MW at planning and construction stages (*Genale Dawa IV, Koysha and Geba*);
- 273 MW of wind power has been developed (*Ashegoda and Adama Wind Farms I & II*), and
- 100 MW Metahara Solar PV Plant is at the final design stages.

Energy Access

- 10,134 biogas plants have been built nationwide, enabling the equivalent number of households shifting from firewood burning to biogas;
- 11,488 solar home systems have been distributed, with over 4,000 home systems and 24 institutional systems installed (for schools and health stations)

Three projects made significant contributions to these targets:

- The *CRGE Energy Plus Program* distributed 4,950 solar home systems and 12 institutional systems (training 20 technicians in the process), benefitting 24,800 people.
- The *FTI Water Solar Power for Water and Irrigation Supply* project installed 42 solar water pumping systems (training 3 persons per site, in the process), benefitting 157,671 people, and
- The *FTI Improving the Livelihoods and Lifestyles of Rural Community of the Emerging Regional States through the Dissemination of Solar Energy Technologies* project distributed 3,273 solar home systems (of which 3,194 are being used), 24 institutional systems (of which four have been installed), 6,593 solar lanterns – collectively benefitting 52,985 people.

freight transport (+13% p.a.) and passenger transport (+9% p.a.) are the primary drivers of increased emissions. (FDRE, 2011)

For the transport sector, the CRGE strategy planned to:

- Introduce stricter fuel efficiency standards for passenger and cargo transportation and promote the purchase of hybrid and electric vehicles to counter the low efficiency of the existing vehicle fleet.
- Construct an electric rail network – powered by renewable energy – to substitute road freight transport.
- Improve urban transport in Addis Ababa by introducing urban electric rail and enabling fast and efficient bus transit.
- Substitute imported fossil fuels with domestically produced biodiesel and bioethanol.

The construction of an electric rail network (9 Mt CO₂e) and the establishment of fuel economy standards for all automobiles (3 Mt CO₂e) are the two main initiatives with the greatest abatement potential. By 2030, more than 5000 km of rail tracks would have been built, as well as new fuel-efficiency criteria for 30% of passenger vehicles and 10% of freight vehicles established.

The introduction of biofuels will also be a priority, despite the lower abatement potential. Increased usage of ethanol and biodiesel in the fuel mix has the potential to reduce CO₂ emissions by 1 Mt CO₂e. (FDRE, 2011)

The Ministry of Transport was allocated funds for two CRGE Fast Track Investment (FTI) projects (FDRE, 2020)

- Smart parking to improve traffic flows and emissions reductions – one location (Merkato) was completed and is under operation. However, because the program was always viewed as a small pilot endeavour, no GHG calculation or impact estimation was done at any stage during the project cycle. The GHG calculation was not incorporated into the project design.
- Share the road – non-motorized transport (walking and cycling) for urban mobility - this project was never implemented because of the problems encountered during the planning stages.

II. Nationally Determined Contributions (NDCs)

Ethiopia was the first LDC country to submit INDCs (Intended Nationally Determined Contributions) to the UNFCCC. (FDRE, 2015a) This was possible because Ethiopia's INDC builds on its Climate Resilient Green Economy (CRGE) strategy. INDC was prepared in parallel to the 5 years strategy development of the country which created more consistent and mainstream planning and consultation processes. The existing CRGE informed INDC which in turn helped the international submission to be grounded into national development priorities through the growth and transformation plan.

According to the figures presented in the updated, second NDC, submitted in 2021, the base year emissions in 2010 are different from the CRGE's. The updated NDC notes that the reason for the difference is due to different methodologies and estimations undertaken when developing the first NDC. The NDC estimated them at 247 Mt CO₂eq, with the BAU scenario projecting a level of 403.5 Mt CO₂eq in 2030. The NDC also identifies interventions that are conditional on the availability of international support as well as interventions that are unconditional and will be financed by the national budget. The unconditional pathway will result in absolute emission levels of 347.3 Mt CO₂eq in 2030, a reduction of 14% (-56 Mt CO₂e from the revised BAU). Further policy interventions proposed under the conditional pathway reduce absolute emission levels to 125.8 Mt CO₂eq, resulting in a combined impact of unconditional and conditional contributions of 68.8% (-277.7 Mt CO₂eq) as compared to the revised BAU emissions in 2030. (FDRE, 2021a)

Ethiopia's updated NDC also projects that the share of the manufacturing industry will reach as high as 17.2% of GDP by 2030- with the possibility of increasing emissions from the sector. Taking this into account, interventions are planned to reduce emissions from the sector in the future. In the conditional pathway, the interventions will reduce emission levels to 22.6 Mt CO₂eq in 2030, compared to the 26.1 Mt CO₂eq BAU projected emissions. This is a relative reduction of 13.4% (-3.5 Mt CO₂eq) compared to BAU emissions. If Ethiopia takes the unconditional pathway, emission levels are projected to be 27.3 Mt CO₂eq. (FDRE, 2021a)

Since most of Ethiopia's industries are small and micro, not much emission is expected from the sector. However, the cement industry is the main source of process-related emissions. Ethiopia's plan to increase the production of fertilizers in the coming ten years will also increase emissions from the sector. Planned interventions in the cement sub-sector are similar to the ones in the CRGE strategy. This means clinker substitution to reduce process related emissions and emission savings from increased nitrogen use efficiency.

In addition to livestock and land-use change and forestry (LUCF), the energy sector has significant mitigation potential in the amended NDC. Renewable energy accounts for most of the grid-connected electricity generation. In 2030, the energy sector will account for 5% of total BAU emissions. In the conditional scenario, policy actions in this sector will cut emissions to 9.5 Mt CO₂eq in 2030 which is a relative reduction of 52.5% (-10.5 Mt CO₂eq) when compared to BAU emissions. The unconditional approach forecasts a reduction in emissions to 15 Mt CO₂eq by 2030, which is 25.5% in sectoral BAU emissions (-5.1 Mt CO₂eq). (FDRE, 2021a)

Sectoral Emissions in the BAU and Mitigation Potentials by Sector and Conditionality						
BAU emission projection (Mt CO ₂ eq)			unconditional emission projection (Mt CO ₂ eq)		Conditional emission projection (incl. unconditional) (Mt CO ₂ eq)	
	2025	2030	2025	2030	2025	2030
Industry	12.7	26.1	-0.2	-1.2	2.5	3.5
Energy	14.4	20.0	1.7	5.1	4.0	10.5
LUCF	133.8	140.2	21.2	48.4	112.3	240.1
Livestock	169.5	194.8	0.8	1.8	6.7	14.8
Managed Soils	8.1	11.5	0.0	0.1	0.1	0.3
Waste	10.3	11.0	0.9	2.0	4.3	8.6
TOTAL (Mt CO₂eq)	348.8	403.5	24.5	56.2	129.9	277.7

Source: FDRE, 2021a

Sectoral Indicators and Lead Institutions (FDRE, 2021a)		
Industry Sector		
Policy intervention	Indicator (unit)	Lead institution/s (responsible)
Clinker Substitution Replacing clinker in cement with adequate and available materials without compromising cement properties	Share of clinker in cement (%)	Ministry of Trade and Industry
Energy and Transport Sector		
Energy efficiency Economy-wide improvements of energy efficiency of appliances, machinery, and other capital assets	Efficiency parameters, e.g., efficiency of appliances and buildings (in %)	Ministry of Water, Irrigation and Electricity (MoWIE)
Industry fuel switches Fuel switch 1: shift from industrial petroleum demand to electricity Fuel switch 2: shift from industrial petroleum demand to sustainable biomass	Energy demand shifted (Renewable energy consumption, TJ) by type of fuel switch	Ministry of Trade and Industry; Ministry of Water, Irrigation and Electricity (MoWIE)

Interventions in the energy sector aim to reduce the amount of energy consumed by all sectors. Investments in the transportation sector can help to reduce petroleum demand by accelerating the adoption of green mobility options such as e-mobility, railroads, and non-motorized transportation. Clean energy exports to neighbouring countries, which are expected to reach more than 5,000 MW/year after the Great Ethiopian Renaissance Dam is connected to the grid, are not included in this mitigation contributions.

The table below summarises the proposed policy interventions, indicators and the lead institutions in the industry, energy and transport sectors which are in some form linked to the industry sector.

III. Policy Developments in the Industrial Sector

Ethiopia has made clear, high-level commitments to pursuing a green development route to accelerate the country's industrialisation drive. This is based on the understanding that if this goal is met, private investors with strong corporate social investment objectives may be enticed to invest in this expanding area. Similarly, this opens the possibility of obtaining financing from climate finance institutions. In terms of industrial growth, the Ministry of Trade and Industry places a high value on the manufacturing sector. To achieve glo-

bal competitiveness, the industrial development vision emphasises building an environmentally friendly industry. As a result, greening the manufacturing sector is in line with the CRGE and the goal of increased industrial growth. (FRDE, 2019) Two policy developments in the industry sector, namely the Ethiopian Green Manufacturing Strategy of 2019 and the Roadmap for Greening Ethiopian Industrial Parks of 2020, stand out as relevant in the context of analysing the progress of implementation of the CRGE Strategy.

***Ethiopia's Green Manufacturing Strategy of 2019 (FDRE, 2019)** was designed with the vision "(f)or Ethiopia to achieve, maintain and be globally recognized for environmentally and socially conscience green manufacturing on a national scale that will increase competitiveness to open new markets abroad and increase the national export volume and value of manufactured goods, thus support Ethiopia to achieve and maintain middle-income status and preserve the integrity of its environment and the health of its inhabitants for future generations". (page 78)*

The **Green Manufacturing Strategy** focuses on improving energy and waste management in Ethiopian industries, as well as lowering energy consumption and waste



as well as encouraging low carbon production. The strategy identifies a set of national priorities for green manufacturing. It also highlights foreign best practices that may be applied to Ethiopia's major industrial sub-sectors, such as cement. The strategy examines institutional arrangements, legislative and regulatory frameworks, the enabling environment, implementation capabilities, and other aspects of the industry sector in detail, identifying important problems that must be addressed. It also lays out specific and well-defined interventions and strategic activities to address the issues. These, if executed, would have a significant impact on the industry sector's development toward achieving the CRGE Strategy's 2030 targets. (FDRE, 2019) Besides adopting this strategy, it remains unclear whether the Ministry of Industry has already started implementing the strategy.

The **Roadmap for Greening Ethiopian Industrial Parks 2020** focuses on identifying and recommending a set of practical policy interventions that will result in a

significant reduction in GHG emissions from industrial production processes while also addressing other environmental, economic, social, and management issues, allowing for a transition to a low carbon industrial development.

The Roadmap is a practical guide for the Ethiopian Industrial Parks Development Cooperation (EIPDC) in planning and operating industrial parks, and it establishes the minimum requirements for an eco-industrial park, as defined by the International Framework for Eco-Industrial Parks (EIPs), which was jointly published by the UN Industrial Development Organisation (UNIDO), the World Bank Group and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in December 2017. The Roadmap is also an operational instrument for implementing the CRGE in the industrial parks, as well as a framework for attracting strategic investors and incentivizing local and foreign direct investment for the EIPDC, being the developer and operator of EIPs. (GGGI, n.a.)

4. CHALLENGES AND OPPORTUNITIES TOWARDS A LOW CARBON GREEN ECONOMY

I. National Action

Ethiopia has been instrumental in establishing the Committee of African Heads of State and Government on Climate Change (CAHOSC) and playing a leadership role in international climate diplomacy, on behalf of Ethiopia as well as Africa, which started almost a year before the 2009 Copenhagen climate conference. The attention Ethiopia gave to green growth and sustainable development was evident when, immediately after Copenhagen, the seat of the UNFCCC focal point was changed from the national meteorological agency to the then Environmental Protection Authority. A technical committee established under the direct supervision of the Prime Minister's office took the responsibility of developing the CRGE. Ethiopia's strong belief in shifting towards a low carbon development pathway gave the country a strong moral basis in the international climate talks.

With the coming into office of the current government in 2018, a lot of uncertainty prevailed particularly at the beginning, with the Ministry of Environment, Forest and Climate Change being downgraded first into a Commission for The Environment, Forest, And Climate Change, and then becoming the Environmental Protection Authority. Such fears have been moderated with initiatives such as Green Legacy, where the Prime Minister led a national effort that reportedly resulted in the planting of more than four billion trees in 2019 and more than five billion trees in 2020. (Ethiopian Monitor, 2021) Moreover, the recently unveiled ten-year plan takes CRGE as one of its central pillars.

Experts in the government mention the Green Legacy initiative to demonstrate that Ethiopia is politically committed to a green (low carbon) development pathway. There is no doubt that all these showed political commitment at the highest level. Political commitment can be inferred from the policy statement, narratives and programs and projects. However, any political com-

mitment inferred this way will be seriously defective if it is not also reflected in the country's budget, revenue, and expenditure. A study undertaken by ODI (Eshetu, 2014) found that the average annual percentage share of climate change-relevant expenditures over the four years of the study (expenditure for 2008/09 to 2011/12) was 11% of total government expenditure. Currently, the Ministry of Finance has designed mechanisms for tracking climate finance expenditure. (MoFEC, 2017) This shows the importance of integrating climate change into the budgetary process.

Political commitment depends on the level to which announced targets and objectives are incorporated into national laws. This is further examined in the following subsection. Political commitment also depends on the extent to which government officials are assessed for their performance in building a low carbon economy. A lot of measures ought to be taken by the government of Ethiopia to signal that its political commitment is not merely symbolic.

II. Means of Implementation

Finance Needs

Ethiopia is challenged by multiple urgent priorities that require undivided financial and technical resources. The increased frequency of drought is putting more stress on the existing food security challenges. Ethiopia's most immediate challenge is poverty, and is thus faced with a challenging complexity of prioritising amongst socio-economic and climate interventions. Ethiopia is continuing to make substantial investments towards climate change mitigation and adaptation but the full implementation of the NDCs is contingent upon international support.

Ethiopia's total budget for NDC implementation is estimated at USD 316 billion of which 20% of the total

estimated finance is unconditional, while 80% is conditional. Ethiopia committed to investing USD 63.2 billion in the NDC actions from domestic sources, which will be approximately USD 6.32 billion per year. The finance required for the conditional element of the NDC requires an equivalent of USD 252.8 billion and is expected to be mobilized from international climate finance sources (FDRE, 2021a)

Meeting the financial needs for implementing the NDCs will require mobilizing additional resources from the government public spending, multilateral and bilateral institutions as well as the private sector and capacitating stakeholders to develop proposals to access additional resources per the domestic and international climate fund's requirements. One of the most critical sectors that should be taken on board is the private sector. The private sector has an enormous potential to contribute to closing the financing gap, particularly in the economically viable investment sectors. Projects such as agriculture, production of biofuels, hybrid and electric cars, and the industries' mitigation measures have been identified as some of the viable options for the private sector to engage. However, there is a need for policy (fiscal) improvement to attract foreign and domestic private investments, as the government budget will not be enough. As part of the government's growth plan, structural reforms are being implemented to strengthen the private sector, promote competition and raise investment. (Lawrence, 2020) As it stands, the private sector in the country is still highly underdeveloped, small, and medium scale and is therefore limiting the investment contribution towards CRGE implementation.

The CRGE Facility was launched to serve as an innovative funding mechanism to support CRGE Strategy implementation. This national climate financing unit, housed under the Ministry of Finance, offers a good opportunity for the country to channel international, national, public, and private financing. The Ministry of Finance, which is accredited under the Green Climate Fund by demonstrating its capacity to undertake projects and programmes, could submit funding proposals that meet the GCF's investment criteria to access resources. Complemented by the Ministry of Finance's attempt to methodologically track climate expenditure, the country has opportunities to increase the effectiveness in climate action, align with and deliver the SDGs and the Paris Agreement, as well as implement real action at national and local levels.

Capacity Needs

There are numerous capacity building attempts in the country. But they require to be strengthened through systemic and institutionalized approaches. Because some of the foundational questions are not solved, many capacity-building projects only tend to address challenges on the surface. High turnover of civil servants coupled with inadequate infrastructural setup and multiple restructurings contribute to the problem. The Ministry of Environment has undergone four major institutional reforms and three rounds of internal organizational restructuring in less than ten years. This lack of stability undermines the quality of work in the country. The CRGE Units in sectoral ministries lack financial resources to carry out more comprehensive activities.

Another identified, significant barrier to mobilise resources is the limited capacity to develop proposals that meet domestic and international climate funds' requirements. But it's important to note that the challenge is not always capacity but also the ever-changing funding application templates, lengthy and rigorous application and review processes and reporting requirements by funds/fund providers.

Another barrier consistently highlighted by stakeholders is a lack of information on climate-related investment opportunities. This can be attributed to a lack of communication between the private sector and the government on NDC activities. Consequently, this makes it difficult to invest in the available opportunities. In addition, when NDC opportunities are presented to the private sector, they are not presented as investment-viable business opportunities.

Ethiopia has still a long way to go in building up a consolidated, synchronised, and perhaps digitised MRV framework for national emissions, despite advances in institutional capacity. A web-based CRGE registry has been established to collate data from the local to federal levels. This is a commendable effort, but challenges like the lack of access to power to utilize computers, few internet connections and even the literacy rate need to be put into consideration. Such frameworks usually replicated from a global north experience, can be challenging to integrate in the context of the socio-economic and cultural realities of the country.

III. Coordinating Across Government and the Private Sector

Through the adoption and announcement of a green economy strategy and the submission of its NDC, Ethiopia has signalled its intention to build a green, low-carbon economy. Several initiatives and projects have been implemented since 2011. This includes setting up mechanisms, upgrading organizations, integrating climate action plans into development plans. But a lot remains to be done in the way of further institutionalisation. This institutionalisation does not just mean building up effective organisations, but also formal and informal guidelines, set to create better understanding and awareness of the issue.

First, the objective or the goal of building a low-carbon economy has been endorsed in the green economy strategy, speeches of prime ministers and officials, development plans, and other communication materials. However, the objective is not provided in any legislation. Of course, the Commission of Environment, Forest, and Climate Change (currently restructuring to become the Environmental Protection Authority) is legally mandated in the areas of climate change. Other than this legislative reference, neither the green economy strategy nor Ethiopia's NDC have been translated into relevant legal enactments. This is partly because the policy itself is high-level and state-centred in its implementation (see also below).

The green economy strategy provides a list of initiatives for growing Ethiopia's economy along a low carbon trajectory. These initiatives are general statements of actions that need to be taken. But who is going to take the lead? What is the role of government? What policy instruments could the government deploy to ensure that those actions are taken? These are questions that were not sufficiently addressed, and the general public's presumption was that the government is the one to take such actions. Such a direct role of government (which in Ethiopia is often considered to be developmental) is self-evident in, for example, power generation.

At the time of the adoption of the green strategy, the government was the sole producer of power, mainly from hydro-dams. Hence the green target relating to the generation of power was understood as an action to be undertaken by the government power producer. It was presumed that the different departments of government were responsible for directly undertaking

the required and identified green initiatives. That the government alone could not build a green economy became clear, especially when considering green industrialisation projects. Hence some legal reforms were undertaken to encourage the participation of the private sector in power generation. But such efforts are yet to yield the expected results fully.

CRGE Units have no authority and no enforcement capabilities over the private sector. Private businesses make up the bulk of players in Ethiopia's industrial and manufacturing sectors – particularly in the cement sub-sector, and therefore the CRGE Unit's ability to achieve outcomes is severely hampered by its lack of genuine power in this area. The Ministry of Industry still lacks the legal framework to compel private enterprises to implement energy efficiency and mitigation measures. (FDRE, 2020)

Institutionalization goes beyond incorporating and reforming formal laws. Secondary legislation, guidelines, and protocols are also required. In this regard, it is observed that the country needs to institutionalise its MRV framework and information management system. The performance of the Ministry of Finance could be taken as an example for others to emulate. The Ministry of Finance has been accredited by the Green Climate Fund (GCF) after meeting the rigorous accreditation criteria, proving how well established the ministry is.

The initiatives identified in the green strategy ought to be implemented programmatically with a clear set of phased actions over a defined period, with clear programmatic results. The recently operationalised programmatic approach to budgeting is a good opportunity to guide the implementation of green initiatives along these lines. Furthermore, the country's recent decision to make CRGE a central pillar of the ten-year plan is a step in the right direction.

Fragmentation of governmental resources, policies and activities is also a serious problem that undermines the effectiveness of government action. This observation can also be made regarding the transition to a low-carbon economy. The fragmentation was hoped to be minimized by upgrading the Environmental Protection Authority into a Ministry. The Inter-Ministerial Steering Committee was also hoped to be a platform for policy coordination. Now the Ministry of Environment, Forest and Climate Change has returned to become an Authority. Low-carbon policies are represented in the Council of Ministers by the Prime Minister to whom the Authority is accountable. But regardless of the institu-

tional set up, the absence of institutionalized directives, guidelines and protocols which enhance coordination, does not help to curtail fragmentation and enhance policy coordination, and hence effectiveness.

IV. Investment opportunities towards the NDC

Despite the identified barriers, various investment opportunities can enhance public and private sector participation. The NDC also presents a chance to contribute to accelerated economic growth and reduce poverty in the country. Particularly assessing opportunities for the engagement of small and medium sized enterprises will be a significant contribution to reducing poverty. Below are some of the investment and economic opportunities that are offered by the NDC interventions.

The NDC calls for the mechanisation of farms through the purchase of tractors, and also improvement of the value chain of agriculture. The improved value chain of agriculture will present opportunities for sectors such as transport and the processing of products. This offers an investment opportunity for the private sector as well as for members of the communities in areas such as transport, processing, or construction of warehouses for the storage components of the agricultural value chain. Consequently, an improved value chain presents investment opportunities, including the manufacturing sector and packaging materials (tin manufacturing, leather processing).

Energy priorities under NDC present an investment opportunity for the private sector to invest in wind turbines and solar panels and brings long term revenues from the sales of electricity, while, at the same time, reducing electricity bills.

Improved waste collection, separation, disposal at the landfills, and wastewater management offer an opportunity to produce biogas at the landfills and sewerage ponds, and generate electricity. Through partnerships with public-private associations, this presents an economically viable investment opportunity.

In addition, at the household level, the initiative also presents an opportunity to produce biogas. This will reduce the time cost of collecting fuelwood and hence reallocating time for productive agricultural activities. Thus, the energy generation from waste will, directly and indirectly, be a good investment opportunity for

the private sector and at the household level. The NDC calls for the production of biodiesel and increased ethanol in the fuel mix. This will require the establishment and operations of the biodiesel and ethanol production plants. Therefore, this is a viable investment opportunity with guaranteed markets as the legal policy documents will support it. Some of the services that will be supported and hence will be equally important investment opportunities for the private sector include the production of sugarcane and the construction of facility plants.

The NDC therefore offers investment opportunities to both small and big investors. It is important to note that further supplementary policies and incentives need to compliment the NDC. It will also have to support rural communities to invest in viable economic activities that will generate revenues and serve as a viable option for transitioning towards a low-carbon economy.

5. CONCLUSION

Ethiopia has shown leadership by committing to a low carbon green economy. The country is taking the right approach by putting an enabling environment in place, by greening the economy, including the manufacturing sector that has a great potential for reducing GHG emissions. This nationally driven transition can only be effective when there is an in-country conviction to ensure that development efforts are sustainable. At the moment, industries are not yet fully developed so setting them off on the right path can ensure sustainable development. Amongst other things, the following policy recommendations will help position the country towards a smooth transition.

A sustained strong political will towards sustainable development: Ethiopia has a strong potential to advance industrialisation while ensuring a net-zero green economy pathway. In assessing the potential, certain fragmentation and gaps in delivery capacity can be noticed. However, the nationally driven commitment towards climate action and building resilience is a step in the right direction. There is also a clear political commitment which can bring policy-makers and practitioners together. Nationally driven and owned processes aimed at building capabilities and systems can bring green industrialisation. It's also important to create confidence for investors by creating consistent and long-standing policies and laws while avoiding erratic changes. Policy and law change needs to be grounded with convincing evidence and strong consultation with relevant stakeholders.

Leapfrogging to ensure the country follows the latest available science and technology: Ethiopia does not need to go through the same challenges and environmentally destructive processes. Leapfrogging could help accelerate sustainable development by skipping inferior, less efficient, more expensive, or more polluting technologies and practices, instead moving directly to more advanced, low carbon options. (Patel/Gebreyes, 2020) Leapfrogging should not be simply catching up because by the time countries catch up, those other countries they look up to would have already progressed. (Tan, 2006) The

manufacturing industry for example needs to ensure that the latest and green technologies are utilised in industrial parks and cement factories. The premises behind policies, planning, strategies, and financing must be connected to the needs of actual implementation. Support provided from developed countries need to target technologies in line with available science and technology. This could also be an opportunity for the private sector to contribute to the climate adaptation and mitigation effort of Ethiopia.

Continued leadership in international development and climate talks: Ethiopia needs to continue playing a leadership role in the international climate talks to put more pressure on developed countries to meet their historic responsibilities and commitments under the UNFCCC and the Paris Agreement. With numerous plans identified, Ethiopia will face a financing gap. It is therefore important to start bringing international finance conversations to the national level and leverage diplomatic channels to access bilateral and multilateral funds.

Linking the international commitment to national implementation: Ethiopia's plans are not only national but international, as they have been formally submitted as part of its NDCs to the UNFCCC. This makes the country more accountable to deliver on these plans. As stated in the NDCs, 80% of the commitment is conditional on international support. The next steps would be translating the commitments into investment plans, projects and programmes to access funding from regional and international entities.

Availability of means of implementation support is critical for effective transition: Such exemplary transition towards low carbon economy is a good example for other developing countries. Thus, this commendable action needs support from developed countries. This support need includes, but is not limited to, overseas development assistance, direct budgetary support, climate finance, global market integration, and preferential treatments in trade and development, capacity building and insertional support programmes.



Ensuring that systems in place complement each other to ensure a holistic implementation: A lot of systems are already in place in Ethiopia. It would be vital to strengthen the CRGE Units by allocating adequate funding to carry out their duties. The need for sustainable, long-term improvements in the technical, administrative, or regulatory capacity of the CRGE Units has become evident for the success of the implementation of the CRGE. The CRGE Facility should be in a position to attract funding from donors and other financial institutions to implement what is indicated in the NDCs.

Increasing public awareness to establish a whole-of-society approach for an inclusive engagement approach: Greening the manufacturing sector and the whole economy should not be seen as a burden but rather as an opportunity for a country like Ethiopia to achieve its goals of becoming a middle-income country by 2025. Ethiopia should mobilise and allocate

resources for the implementation of its Green Manufacturing Strategy to increase its competitiveness for new markets, including the African Continental Free Trade Area, increase the national export volume and the value of manufactured goods as indicated in its vision. This should be backed by increasing the public's awareness of why going green is the viable way.

Collaboration with the Private sector: The government should put the appropriate enabling environment in place to work with the private sector and for the latter to abide by the rules and regulations set by the government. Particularly in sectors that are highly dominated by the private sector, such as the cement industry, it is important to have stakeholder engagement when it comes to developing emission reduction measures and action plans.

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