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Eastern and Southern Africa



Climate-Resilient Green Economy
Implementation and Best Practices on
Climate Action in **ETHIOPIA**



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1. Introduction

Ethiopia is experiencing the effects of climate change. Besides the direct effects such as an increase in average temperature or a change in rainfall patterns, climate change also presents the necessity and opportunity to switch to a new, sustainable development model. The Government of the Federal Democratic Republic of Ethiopia therefore initiated the Climate-Resilient Green Economy (CRGE) initiative in 2011 to protect the country from the adverse effects of climate change and to build a green economy that will help realize its ambition of reaching middle income status before 2025. Ethiopia intends to limit its net greenhouse gas (GHG) emissions in 2030 to 145 Mt CO₂e or lower. This would constitute a 255 MtCO₂e reduction from the projected 'business-as-usual' (BAU) emissions of 400 MtCO₂e in 2030 or a 64% reduction from the BAU scenario in 2030.

Ethiopia also intends to undertake adaptation initiatives to reduce the vulnerability of its population, environment and economy to the adverse effects of climate change. The CRGE is Ethiopia's strategy for addressing both climate change adaptation and mitigation objectives. The implementation of the CRGE would ensure a resilient economic development pathway while decreasing per capita emissions by 64% or more. This is what Ethiopia communicated in its Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) according to Paris Agreement (Article 4.2).

2. Planning and Implementation

The planning process and implementation of Ethiopia's CRGE strategy follows a sectoral approach and uses the existing government institutional arrangements at all levels. Sectors included in the CRGE are Agriculture (livestock and soil), Forestry, Transport, Electric Power, Industry (including mining) and Buildings (including Waste and Green Cities). The plan and action to mitigate GHG emissions is built on the following four pillars:

- 1) Improving crop and livestock production practices for greater food security and higher farmer incomes while reducing emissions;
- 2) Protecting and re-establishing forests for their economic and ecosystem services, while sequestering significant amounts of carbon dioxide and increasing the carbon stocks in

landscapes;

- 3) Expanding electric power generation from renewable sources; and
- 4) Leapfrogging to modern and energy efficient technologies in transport, industry and building sectors.

The emissions reduction of 255 MtCO₂e or 64% compared to BAU emissions in 2030, is made up of 90 Mt CO₂e from agriculture; 130 Mt CO₂e from forestry; 20 Mt CO₂e from industry; 10 Mt CO₂e from transport; and 5 Mt CO₂e from buildings. This does not include the reduction of 19 Mt CO₂e in neighboring countries due to the export of electric power to them from Ethiopia. Based on the national CRGE strategy, aforementioned CRGE implementing sectors have developed sector specific Climate Resilience (CR) strategies in their contexts. Moreover, the most promising CRGE interventions are identified and prioritized by each sectors CR strategy, and integrated into the sector's Second Growth and Transformation Plan (GTP II) (2015-2020) and also into the next ten years (2020-2030) national development plan.

3. Climate Action Undertaken to Enhance Resilience

3.1 Institutional capacity building

Ethiopia has undertaken several strategic and programmatic adaptation and mitigation actions.

The strategies and plans which are enabling actual implementations of climate actions include:

1. The National Adaptation Programme of Action (NAPA) of 2007;
2. The Ethiopian Programme of Adaptation to Climate Change (EPACC 2011);
3. Nine National Regional States and two City Administration adaptation plans;
4. Five sectoral adaptation plans;
5. Climate Resilience Strategy in Agriculture and Forestry;
6. Climate Resilience Strategy in Water and Energy;
7. Climate Resilience Strategy in Transport;
8. National Adaptation Plan (2017);
9. Guideline for Integrating the CRGE into Sector Development Plans;
10. CRGE Sectors Roadmap for Implementation of Green Economy Mitigation Actions.

3.2 Actual climate actions undertaken by the Sectors

3.2.1 Agriculture sector

In the ministry of agriculture, several large-scale sustainable development programmes are ongoing. For instance, Community Mobilization Integrated Watershed Management Campaign, Sustainable Land Management Programme, Productive Safety Net Programme and Development Response to Displaced Impacts Project are promoting natural resource management actions which will contribute to building resilience to climate change in the natural resources sub-sector. Regional Pastoral Livelihoods Resilience Project, Livestock and Fishery Sector Development Project and Drought Resilience Sustainable Livelihoods Project are promoting livestock development actions in pastoral areas which will contribute to building resilience to climate change in the livestock sub-sector.

III. CSA options implemented in NRM sub-sector



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Integrated natural resource management and feed development in Ethiopia

Participatory Small Scale Irrigation Development Programme, Adaptation Fund and GCF Projects are promoting small scale irrigation and livelihood improving interventions to improve adaptive capacity and resilience to climate change impacts. The Agriculture Growth Programme and other government initiatives

are promoting low land wheat production in arid and semi-arid areas through small, medium, and large-scale irrigation schemes to increase crop production and reduce the pressure on forests by reducing expansion of the cultivated land to forest areas. All these efforts are enhancing the sector's resilience to climate change impacts, as well as reducing emissions.



Small scale irrigation and low-land wheat development in arid and semi-arid areas in Ethiopia

3.2.2 Forestry sector

Deforestation and forest degradation must be reversed, and forests must be protected and re-established for their economic and ecosystem services, including their role as carbon sinks. Therefore, the government and different programmes in the forestry sector are promoting fuel-efficient and alternative-energy sources, afforestation, reforestation, forest management and area closure to improve ecosystem services and increase carbon sequestration in forests and woodlands. To reduce land degradation and attain its ambitious goal in the forestry sector, Ethiopia undertook a major national reforestation programme by planting four billion trees in 2019, with the more ambitious target of planting five billion trees by 2020. All these efforts lead to an increased storage of carbon in vegetation and allows the forestry sector to yield negative emissions, i.e., store more carbon in growing forests than are emitted from deforestation and forest degradation.



Ethiopian Prime Minister H.E Dr. Abiy Ahmed kicked off a mission to plant four billion trees

3.2.3 Power and Energy sector

3.2.3.1 Hydropower development

Ethiopia is endowed with ample natural resources to meet its own electricity demand, by exploiting its vast potential for hydro, geothermal, solar and wind power all of which deliver electricity at virtually zero GHG emissions. Ethiopia's hydropower potential is estimated to be 15,000 - 30,000 MW. In order to develop this vast potential of power several projects have been initiated to generate more and more hydroelectric power. The government has ploughed billions of dollars into hydropower megaprojects such as the Grand Renaissance Dam - which will be the largest dam in Africa - and the newly inaugurated Gibe III Dam.



The Ongoing Ethiopia's Grand Renaissance Dam

3.2.3.2 Geothermal power

Many locations within in Ethiopia's Rift Valley provide natural superheated steam which can be obtained through drilling. The geothermal potential of Ethiopia been estimated at about 4,000 MW. The economic contribution that this resource might make to the energy economy of Ethiopia is expected to be great but needs to be studied and looked into in detail in a coordinated manner with other forms of energy. Currently, Ethiopia is in the process of constructing a 150 MW geothermal power plant in the Ethiopian Rift Valley.

3.2.3.3 Wind energy

Ethiopia is a country benefitting from an abundance of wind energy resources in every region. Ethiopia inaugurated one of the continent's largest wind farms in 2013 - the \$290 million, 120-megawatt (MW) Ashedoga wind farm which supplies electricity to more than 3 million Ethiopians. This was followed by the even larger 153 MW Adama II facility in 2015. Wind power accounted for just 324 MW of Ethiopia's total output of 4,180 MW at the end of 2015, with the bulk coming from hydropower. The powerful wind resource allows the Ethiopian Electric Power Corporation (EEPCo), the national electric company, to produce each kWh at low



cost (0.06 €/kWh).



Ashedoga and Adama II wind farm supplies electricity Ethiopia

Finally, all these efforts made by the power and energy sectors has enabled the country to grow the generation of clean and renewable electric power. Maximizing energy efficiency allows for green development of other sectors of the economy, such as the replacement of trucks by electric rail or diesel pumps by electric pumps for irrigation that enabled the sectors to reduce their GHG emissions. Moreover, via electricity exports, Ethiopia shares its green development to other countries in the region to replace electricity generated from fossil fuels, which has significantly higher average costs and GHG emissions.

3.2.4 Transport, Buildings and Industrial sectors

3.2.4.1 Transport sector

The transport, industry and building sectors need to leapfrog to modern and energy efficient technologies. The government sees the opportunity to gear the development of the transport sector to contribute to a sustainable development pathway by:

1. Constructing an electric rail network powered by renewable energy to substitute fossil fuel

- powered road transport;
2. Improving urban transport in Addis Ababa by introducing urban electric rail, and enabling fast and efficient bus transit;
 3. Introducing stricter fuel efficiency standards for passenger and cargo transportation and promoting the purchase of hybrid and electric vehicles to counter the low efficiency of the existing vehicle fleet;
 4. Substituting imported fossil fuels with domestically produced biodiesel and bioethanol.

In order to realize the transport sector's opportunity to contribute to a sustainable development 756-km Ethiopia-Djibouti railway has constructed and connected Ethiopia to the Red Sea seaport of neighboring Djibouti with zero emission in January 2018. Shifting transport from road to rail would not only decrease transport costs and improve the trade balance through reduced import of fossil fuels (economic benefits), but would also lower emissions, congestion, air pollution, and traffic accidents (social and environmental benefits).



Ethiopia-Djibouti railway station Sebbeta, Ethiopia

In order to improve urban transport in Addis Ababa city, the first light rail line in Addis Ababa was opened on 20 September 2015 to sample the new service with zero emission. Designed to relieve the growing road congestion as the city's population passed 5 million inhabitants, the 34 km two line network serving 39 stations was constructed at an cost of US\$475m. Shifting the city transportation systems from road to



railway not only decreases transport costs, but also reduces CO2 emissions significantly by replacing a the high emission old vehicles.



Addis Ababa city light railway, Ethiopia

3.2.4.2 Buildings sector

The rapid growth of cities will require large scale investments in urban infrastructure and management systems for solid and liquid waste - the two largest sources of emissions in cities. Off-grid fossil fuel energy use (e.g., diesel generators, kerosene lamps) is the largest source of GHG emissions in the buildings sector. In order to reduce emissions from the sector, the following three major green economy initiatives identified are:

1. Accelerated transition to high efficiency light bulbs for residential, commercial, and institutional buildings,
2. Use of landfill gas management technologies (e.g., flaring) to reduce emissions from solid waste,

3. Reduction of methane production from liquid waste.

As aforementioned, solid and liquid waste and off-grid fossil fuel use were the largest source of GHG emissions in the sector, but the growth of inexpensive electricity generated from renewable sources has significantly contributed to the reduction of CO₂ emissions from off-grid fossil fuel use. To reduce emissions from solid and liquid waste, Ethiopia's waste-to-energy plant, a first in Africa, was constructed to transform the site and revolutionize the entire city's approach to dealing with waste. The plant, which is due to begin operating in January, will incinerate 1,400 tons of waste every day which is about 80 per cent of the city's waste and will reduce GHG emissions from the sector in addition of energy generation.



Ethiopia's waste-to-energy plant is a first in Africa

3.2.4.3 Industrial sectors

Among the industrial sub-sectors, cement will be one of the fastest growing, also causing the vast majority of GHG emissions from the industry sector. Output will increase tenfold from 2.7 Mt in 2010 to 27 Mt in 2015. Some cement factories use outdated technology that is not only energy inefficient, but also causes high



emissions from the production process. The CRGE initiative has identified a series of innovations that could help to increase the competitiveness of the cement industry by reducing production costs and at the same time would yield significant environmental and health benefits:

1. Improved energy efficiency of the process by converting the technology used from dry to precalciner kilns and from rotary to grate coolers and by introducing computerized energy management and control systems, which can decrease the energy demand and hence the cost of and emissions from cement production;
2. Substitution of clinker by increasing the pumice content leading to a decrease in both variable production costs and emissions,
3. Increased share of biomass in the mix of energy for production in cement factories, potentially decreasing costs and emissions.

Although the cement sub-sector has been highlighted in this report because it represents the most GHG emitting industry and its GHG abatement initiatives have high chances of implementation, the government has taken action that can improved energy efficiency of the process by changing to modern technology and introducing computerized energy management and control systems, which has decreased the energy demand, and GHG emissions from some cement industries.

4. Conclusion

The Federal Democratic Republic of Ethiopia is taking measures to adapt to the inevitable reality of climate change, which is expected to intensify as the world's climate changes, due to both the already accumulated and anticipated global GHG emissions. Ethiopia requires substantial resources to limit its emission of GHGs and to build resilience to climate shocks. To this end, Ethiopia has already committed significant resources to reduce GHGs and build resilience including:

- Afforestation and land rehabilitation interventions;
- Generation and distribution of electricity from clean and renewable sources;
- Investment in improved transportation systems (e.g. railway) that utilize clean and renewable energy.

In order to realize the full potential of its mutually reinforcing objectives of reducing emission and building resilience, Ethiopia seeks to utilize existing and emerging climate finance mechanisms. Ethiopia also welcomes the continued support of bilateral and multilateral development partners, as well as the engagement of the private sector in achieving its ambitious goals set under the NDC. In this context, Ethiopia has already put in place a national fund, the Climate Resilient Green Economy Facility (CRGE Facility), as a mechanism to mobilize finance from various sources, and drive investments to build resilience and for green growth. The key features of the CRGE Facility are:

- Providing flexible, coordinated and predictable funding to support the achievement of national priorities set out under the CRGE;
- Blending diverse sources of climate financing and leveraging public funds to attract private funds; and
- Providing a unified engagement point where government, development partners, civil society and other stakeholders can engage and make decisions about climate change issues.

The Facility has already managed to attract resources from a number of bilateral and multilateral development partners. In this context, Ethiopia reaffirms its continued commitment to build a climate resilient green economy. Ethiopia's government is pressing ahead with ambitious development plans, and clean energy is the core of the mission. Ethiopia was among the most daring signatories to the Paris Agreement on climate change, committing to cut carbon emissions by 64% by 2030.





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