Climate Resilient Green Economy Strategy

Sector-wise GTP II Implementation Monitoring Checklist

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Acknowledgments

The production and translation of this checklist was made possible through the active participation, support and cooperation of different organizations and individuals whose efforts deserve to be acknowledged. Appreciation is given to Debasu Bayleyegn, Director General, Climate Change Implementation Coordination of the Ministry of Environment, Forest and Climate Change (MEFCC), Polly Ericksen, Program Leader, Sustainable Livestock Systems at the International Livestock Research Institute (ILRI) and Dawit Solomon, East Africa Program Leader of CGIAR's Research Program on Climate Change, Agriculture and Food Security (CCAFS) who led the initial discussions and follow-up efforts that led to the translation of Ethiopia's Climate Resilient Green Economy Strategy Sector-wise GTP II Implementation Monitoring Checklist from Amharic to English. We acknowledge support from Getachew Eshete and Million Tadesse for undertaking the translation and Maren Radeny for editing the final report. We also appreciate the inputs made by Lili Szilagyi, Catherine Mungai and Tabitha Muchaba in the layout and design of the report.

This work was made possible through financial support from the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), East Africa, which is carried out with support from CGIAR Fund Donors and through bilateral funding agreements, and the Sustainable Livestock Systems (SLS) Program of the International Livestock Research Institute (ILRI).

Acronyms

GE	Green Economy
CRGE	Climate Resilient Green Economy
DRMFS	Disaster Risk Management and Food Security
EPA	Environmental Protection Agency
GDP	Gross Domestic Product
GTP	Growth and Transformation Plan
IRA	Immigration and Refugee Agency
MEFCC	Ministry of Environment, Forestry and Climate Change
MoANR	Ministry of Agriculture and Natural Resources
MoCT	Ministry of Culture and Tourism
MoE	Ministry of Education
MoH	Ministry of Health
MoI	Ministry of Industry
MoLF	Ministry of Livestock and Fisheries
MoLSA	Ministry of Labour and Social Affairs
MoPNG	Ministry of Petroleum and Natural Gas
MoT	Ministry of Transport
MoUDH	Ministry of Urban Development and Housing
MoWCY	Ministry of Women, Children and Youth
MoWIE	Ministry of Water, Irrigation and Electricity

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Introduction

Poverty eradication through broad-based accelerated and sustained growth is outlined in the Growth and Transformation Plan (GTP). Through Agricultural Development-Led Industrialization (ADLI), the country aims to build an economy with a modern and productive agricultural sector and a strong industrial sector, ultimately increasing per capita income to the level of middle-income countries by 2025. Achieving these ambitious objectives is challenging, but vital for the future of Ethiopia and its citizens. Climate change is one of the major current challenges and adds considerable stress to the societies and environment. From shifting weather patterns that threaten food production to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. Ethiopia has historically suffered from climatic variability. Repeated rain failures, famines and chronic food crisis resulting from frequent droughts, environmental degradation, and decline in food production have rocked the country many times and remain a major challenge. The country's economic output growth is closely linked to fluctuations in precipitation levels, as its agriculture is highly rain-fed, with only 2% of total arable land covered by irrigated and permanent crops. This strong association between rainfall and the economy is largely due to the nature of the country's most dominant sector, agriculture and weak capacity of the rural population to adapt to climate variations.

Current and historic climate

- Temperatures have increased by an average of around 1°C since the 1960s. Rainfall is highly variable which makes identifying trends difficult, though there has been a 20% decrease in the south-central region of the country.
- Current weather variability leads to droughts, floods, and soil erosion. There are indications that the incidence of floods and droughts may have been increasing over recent years.
- Current vulnerability to weather variability. The economic impact of climate depends on the extent of annual weather variability and extremes, but recent major droughts have reduced GDP by 1% - 4%. Rain-induced soil erosion has been estimated to reduce GDP by around 1%.
- The impacts on agricultural livelihoods depend on the livelihood type and region of Ethiopia. This underscores the need for resilient responses that are grounded in local context.

Future climate change, impacts and costs

- There is a high degree of uncertainty in the future projections of temperature and rainfall arising from climate change in Ethiopia. While temperatures will rise, the future level is uncertain, with the projections indicating a 0.5°C to 2°C increase by the 2050s relative to today. There is greater uncertainty as to whether rainfall will increase or decrease and the projections indicate a change in national annual average rainfall from -25% to +30% by the 2050s.
- Future climate change could have significant economic impacts. Under some extreme scenarios the impact of climate change on all sectors could reduce GDP by 10% or more by 2050. This potential decrease in GDP could impact Ethiopia's ambition to reach middle-income status by 2025.

Adapting to these impacts will be more difficult and costly, and hence demand strong actions and the necessity and opportunity to switch to a new, sustainable development model. In response, the government launched the Climate Resilient Green Economy (CRGE) initiative, to build a middle-income country that is both resilient to the impacts of climate change and low in greenhouse gas emissions. Environmental conservation plays a vital role in sustainable development. Building a 'Green Economy' and ongoing implementation of environmental laws are among the key strategic directions to be pursued in the GTP. These can be achieved when concerned sectors develop their annual plans towards contributing their share in building resilience and reducing greenhouse gas (GHG) emissions, which is mandatory and can be implemented at different levels. Development of GHG emission measurement and reporting mechanism (MRV system) and implementation of reduction actions need to be monitored by concerned sectors. These concerned bodies should monitor the achievement based on the target-set and make sure the result is recorded and documented. Below is a detailed sector-wise checklist of reduction activities, set out by responsible line ministries during the GTP II period (2016-2020), towards contributing their share in building resilience and reducing GHG emissions.

GTP II checklist of the ministries

Sector-wide

Table 1. All sector mitigation and adaptation interventions

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
	Capacity building and access to information	Strengthen capacity building and institutional coordination	Strengthen climate change information and institutional coordination	Adaptation and mitigation	• Number of research and research outputs on impact of climate change on development activities, and mitigation and adaptation measures taken • Number of people trained/got awareness of climate change at different administrative levels in the sector following research findings • List of activities included and undertaken at different administrative levels following the recommendation of research through climate change impact analysis and findings	All sectors

2

Agriculture

Agriculture

Agriculture is the most vulnerable sector to the impacts of climate change in Ethiopia, as it is mainly rainfed. Agriculture plays a major role in Ethiopia's economy, contributing 43% of GDP, about 80% of employment and approximately 75% of export commodity value (Draft CR strategy).

Ethiopia has a land area of 1.1 million km^2 and a diverse agricultural sector. Crops currently make up 67% of agricultural GDP (27% of total GDP). Crop production is a major source of GHG emissions through fertilizer used and nitrous oxide (N_2O) emissions from crop residues, producing 12 $MtCO_2$-eq a year in 2010. GE Strategy estimates it will increase to 60 $MtCO_2e$ a year by 2030 under a business as usual scenario. Livestock is also significantly contributing to Ethiopia's GDP and is the main source of income for a significant proportion of the population. A large share of GHG emissions comes from livestock production and is expected to expand even faster than the current situation.

The Agricultural Climate Resilient Green Economy's (CRGE) vision sets out the goal of achieving the GTP objectives without increasing GHG emissions and in a way that is resilient to climate variability and climate change. Accordingly, the sub-sector identified four mitigation and adaptation interventions to be implemented in GTP II: reducing emissions from deforestation due to agricultural land expansion, modernizing the agricultural system, improving the efficiency of livestock value chain, and increasing crop productivity.

Table 2. Agriculture

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
2	Agriculture	Undertake environmental and social impact assessment	Set up environmental and social impact assessment system	Adaptation and mitigation	• Number of investments in the sector approved following environmental and social impact assessment	MoLF/ MoANR
2.1	Livestock	Improve efficiency of livestock value chain	Increase livestock value chain efficiency to increase productivity	Adaptation and mitigation	• Number of farmers and pastoralists participating in the efficient value chain • Number of productive and productivity enhanced livestock • Number of sheep, goats, and camel with improved productivity due to value chain efficiency Amount of GHG emission reduced due to increase of value chain efficiency (CO2-eq tonnes/year)	MoLF

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
		Application of lower-emitting technologies	Enhancing and intensification of diversifying animal mix towards less emitting animals	Mitigation	• Number of farmers and pastoralists involved in production of less emitting species (e.g. poultry, sheep, goat and fish) • Number and types of lower-emitting species (e.g. poultry, sheep, goat and fish) produced • Amount of GHG emission reduced from increasing lower-emitting species mix (CO2-eq (mt)/year) • Number o f farmers and pastoralists who improved their livelihood as a result of increased use of lower-emitting livestock mix	MoLF
		Rangeland and pasture management	Improvement of rangeland and pasture management	Adaptation and mitigation	• Number of farmers and pastoralists who participated and benefited from improved rangeland and pastureland management practice • Amount of rangeland and pastureland developed through application of improved rangeland and pastureland management practices Annual GHG emission reduced through application of improved rangeland and pastureland management practices, (CO2-eq (mt/year)	MoLF
		Animal health service	Strengthening and expansion of animal health services	Adaptation	• Type and number of existing animal health service delivery infrastructures by region, district including urban • Number of farmers, pastoralist and private investors who benefit from animal health service delivery infrastructure • Number of animals obtaining veterinary service from animal health service delivery infrastructure by species or types	MoLF

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
			Prevention and control of spread of existing vector-borne diseases and macro-parasites, accompanied by the emergence and circulation of new diseases as a result of climate change	Adaptation	• Areas vulnerable to climate change, the induced spread of existing vector-borne diseases and other diseases like macro-parasites, emergence and circulation of new diseases • Early warnings, action taken • Number of animals obtaining veterinary services by species • Number and types of animal diseases controlled as a result of early warning actions • Number of households benefiting from animal health services	MoLF
2.2	Crops	Reducing deforestation/ the pressure of agriculture on forest	• Increasing productivity of existing cropland through use of selected varieties and agricultural inputs • Establishment of large scale and medium scale irrigation • Improving productivity of unproductive land through the widespread use of natural fertilizer	Adaptation and mitigation	• Amount of agricultural land under large and medium scale irrigation (ha) • Amount of mismanaged agricultural land under large and medium scale irrigation (ha) • Amount of properly managed agricultural land under large and medium scale irrigation (ha) • Amount of crop yield obtained in 100 kg/ha per year by crop type • Amount of chemical and artificial fertilizer prepared and applied, in 100 kg/ha per year • Amount of improved seed applied, in 100 kg, by crop type • Number of people who benefit from irrigation development • Amount of GHG emission reduced (CO2-eq(mt)/year)	MoANR

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
			Lands developed through application of modern mechanization system	Adaptation and mitigation	• Number of farmers trained on or aware of the use of modern mechanization • Size of agricultural land developed through modern mechanization (ha) • Number of private investors involved in modern mechanization • Number of farmers using modern mechanization system by gender • Amount of crop yield obtained from the use of modern mechanization system, in 100 kg/ha per year • Amount of GHG emission reduced from agricultural land as a result of the use of modern mechanization system (CO2-eq (mt)/year)	MoANR
		Enhance yield-increasing practices	Expanding the use of profitable/cost-effective new crop varieties	Adaptation	• Number and types of disease and pest resistance, drought tolerant and productive varieties identified by research and adopted by farmers • Number of farmers trained or aware of profitable and cost-effective crop varieties	MoANR
			Increasing use of chemical and natural fertilizer	Adaptation and mitigation	• Amount of natural fertilizer prepared (mt/year) • Amount of land developed through application of natural fertilizer (ha) • Amount of yield obtained from the application of natural fertilizer, in 100 kg/ha per year • Amount of chemical fertilizer used/applied (mt/year)	MoANR

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
					• Area of land developed through application of chemical fertilizer (ha) • Amount of yield obtained from the application of chemical fertilizer, in 100kg/ha per year	
2.3	Natural Resource Conservation and Management sub-sector	Sequestration of GHG emission through integrated Natural Resource Conservation and Management	Rehabilitate deforested watershed to protect soil erosion and increase carbon sequestration	Mitigation	• Watershed area and landscape rehabilitated through integrated land management (ha) • The productivity of the rehabilitated watershed area managed through integrated land management (mt/year) • Production of forage from rehabilitated land through integrated land management (t/year) • Amount of carbon sequestered through integrated land management (mt)	MoANR
			Improve sequestration of GHG emission and protect soil erosion through area closure of deforested watershed, land and gullies	Mitigation	• Watershed area and landscape rehabilitated through area closure and gulley control (ha) • Number of women and youth who benefited from developing the rehabilitated land	MoANR
		Enhance soil fertility	Use low carbon technologies/farming methods	Adaptation	• Area of land developed through improved soil and crop management (ha) • Area of land developed through integrated watershed management (ha) • Number of households benefitting from the extension of agroforestry	MoANR

3

Forestry

Forestry

The Climate Resilient Green Economy's (CRGE) vision aims to achieve the GTP objectives with no net increase in greenhouse gas emissions and in a way that is resilient to climate variability and climate change. The CRGE underpins the overall GTP with low carbon and resilient climate development as essential to achieving and mainstreaming the long-term objectives of the GTP. Forestry contributes to the national economy and makes up 9% of agricultural GDP (4% of total GDP). Forest and woodlands also contribute to the livelihoods through the provision of timber, fuel-wood and non-timber forest products. Informal forest-based activities (e.g., firewood collection) contribute more than 30% of per capita income in some areas. Forests also provide benefits for food security, health, employment and support wider ecosystem services (e.g., rainwater filtration, flood control and soil retention), which in turn provides economic benefits. In forestry, the impact of human activities is a large source of CO2 emissions amounting to almost 55 Mt CO_2-eq in 2010. Forestry emissions are driven by deforestation for expansion of agricultural land (50% of all forestry-related emissions) and forest degradation due to fuelwood consumption (46%), as well as formal and informal logging (4%).

Table 3. Forestry

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
3	Forestry	Increase carbon sequestration	Plantation to control soil erosion and sequester carbon	Mitigation	• Seedlings grown, including species • Area of plantation forest (ha) • List the ecosystem, economic and social benefits of the plantation • Number of households benefitting from the plantation • Amount of carbon sequestered by the plantation (t/year)	MEFCC
			Reforestation through ex-closure and enrichment planting to control soil erosion and sequester carbon	Mitigation	• Area of exclosures (ha) • Seedlings grown in degraded forests includes species • Area of forest land rehabilitated (ha)	MEFCC

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
					• Number of households benefitting from rehabilitated forest • List of ecosystem, economic and social benefits of the rehabilitated forest • Amount of carbon sequestered by the rehabilitated forest (mt/year)	
			Enhance the services of protected forests through improved management	Mitigation	• Protected forest areas in the country (ha), includes types • Area of managed protected forest areas in the country (ha) • List of ecosystem, economic, and social benefits of the protected forests • Amount of carbon sequestered by the protected forests (mt)/year)	MEFCC
		Protect and reduce forest fires	Construct firebreaks to protect forest fires	Mitigation	• Number of households who got awareness on the causes and reduction of forest fires (No) • Strategy to protect forest fires	MEFCC
		Protect and reduce forest diseases and pests	Protect and reduce forest diseases and pests resulting from changing the climate	Adaptation	• Number of climate change induced forest diseases and pests observed and protected • Number of disease and pest resistant tree species released through research	MEFCC
		Protect landslide vulnerable sites	Plant trees around roadsides vulnerable to landslides	Mitigation	• Number of trees planted to protect landslide	

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
			Remove old trees along roadsides vulnerable to wind throw and replace with saplings	Mitigation	• Area of roadside with old trees vulnerable to windthrow replaced by saplings (ha) • Number of roadside old trees vulnerable to wind throw replaced by saplings	MEFCC
		Reduce firewood consumption	Disseminate improved cook stoves to reduce firewood consumption	Mitigation	• Number of households aware of improved cook stoves • Number of improved cookstoves distributed, and types • Number of households that use improved cook stove technology (gender disaggregated, region and woreda) • Amount of GHG emission reduced due to the utilization of the improved cook stove technology (CO_2-eq (mt/year) • Number of cooperatives organized in improved cook stove production	MEFCC
3.1	Conservation of biodiversity	Reduce loss of biodiversity	Identify causes of biodiversity loss and reduce the losses	Adaptation	• Number of established ex-situ and in-situ sites • Number of conserved biodiversity species • Number of established gene banks • Genetic resources conserved includes types	MEFCC
3.2	Wetlands	Care for wetlands	Setup a regulatory system to protect wetlands	Adaptation/ mitigation	• Number of households with awareness of wetlands • Area of degraded wetlands rehabilitated (ha) • Number of newly established working procedures on wetlands	MEFCC

4

Renewable energy and water supply

Renewable energy and water supply

Energy and water are key to the CRGE and Ethiopia's goals for economic growth and poverty reduction. Sustainable water and energy supply are expected to contribute about USD 7.2 billion of planned GDP growth in the GTP period and achievement of the MDGs by freeing up productive time and improved health. Access to energy and water could prevent the loss of approximately 1.2 million lives. The energy sector accounts for very low levels of GHG emissions, as it is largely based on renewable energy, with hydro power accounting for more than 90% of total power generation capacity, supplemented by the use of on and off-grid diesel generators administered by the Ethiopian Electric Power Corporation (EEPCo). Current GHG emissions in the energy sector are estimated to be below 5 Mt CO_2-eq, translating to 3% of the country's total GHG emissions. This is far below, the global average share of GHG emissions from the energy sector for most countries of more than 25%. Enhancing alternative and renewable power generation and management options will emphasize the sustainability of the energy sector by enhancing ways of ensuring that power generation capacity withstands climate change impacts; by ensuring diverse energy mix, improving energy efficiency and accelerating access to off-grid energy.

Table 4. Renewable energy and water supply

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
4	Renewable energy and water supply	Undertake environmental and social impact assessment	Set up environmental and social impact assessment system	Adaptation and mitigation	• Environmental and social impact assessment of infrastructure to be built by the sector	MoWIE
		Use clean fuel technologies	Distribute electric stoves	Mitigation	• Number of households with awareness on electric stoves • Number and types of electric stoves distributed • Number of households using the electric stoves • Amount of GHG emissions reduced (CO2-eq (mt)/ year) • Number of households connected to the national grid with own meter • Number of households connected to the national grid with shared meterWater pumps using renewable energy technologies includes the type of energy	MoWIE

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
			Distribute LPG stoves	Mitigation	• Number of households aware of LPG stoves • Number and types of LPG stoves distributed in rural areas • Number and types of LPG stoves distributed in urban areas • Number of households using LPG stoves • Amount of GHG emission reduced (CO2-eq (mt/ year)	MoWIE
			Distribute biogas stoves	Mitigation	• Number of households aware of biogas stoves • Number and types of biogas stoves distributed in rural areas • Number and types of biogas stoves distributed in urban areas • Number of households using biogas stoves • Amount of GHG emission reduced (CO2-eq(mt/ year)	MoWIE
		Use clean fuel technologies in modern buildings	Supply energy efficient bulbs to residential, commercial and business buildings	Mitigation	• Number of compact fluorescent light (CFL) bulbs distributed in residential areas • Number of high-efficiency bulbs supplied to business and manufacturing industries • Policy and legal measures taken to ban energy inefficient incandescent lamps • Increased number of households using grid electricity from renewables	MoWIE

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
					• Number of people that replaced diesel-powered pumps with renewable energy technologies • Amount of power generated through transforming waste to energy (MW) • Amount of GHG emissions reduced (CO_2-eq (mt)/year)	
		Improve water supply systems	Improve water supply systems in rural and urban areas	Adaptation	• List of activities performed to protect surface and groundwater from pollution • Number of people using springs and wells that use renewable energy technologies • List of measures taken and results achieved to decrease wastage of water by suppliers and consumers	MoWIE

5

Transport

Transport

This Climate Resilient Transport Sector Strategy sets the framework for the Government of Ethiopia to deliver an integrated, modern transport system with a strong focus on multi-modal transportation links and customer service. The vision of this strategy is to ensure that Ethiopia's national development, poverty reduction, and climate resilience goals are promoted in the transport sector. This multi-pronged focus aligns with the direction set by the government in its national level strategies and provides the Ethiopian transport sector with a unified vision, mission and implementation plan. Underpinning the vision are the key principles of safety, sustainability, integration and affordability, consistent with the national vision outlined in the CRGE strategy and existing sectoral strategies and plans. About 75% of the emissions from the transport sector comes from road transport, particularly freight and construction vehicles, and to a lesser extent private passenger vehicles. Air transport also contributes a significant share, about 23% of transport-related emissions), while emissions from inland water transport are minimal.

Table 5. Transport

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
5	Transport	Undertake environmental and social impact assessment	Set up environmental and social impact assessment system	Adaptation and mitigation	• Number of projects assessed on environmental and social impact • Number of projects approved on environmental and social impact • Number of projects monitored on environmental and social impact	MoT
		Modernize transport by transforming to fuel-saving vehicles	Decrease fossil fuel consumption through incentivizing the availability of new electric and hybrid cars	Mitigation	• Number of electric and hybrid cars • Transport service provided by electric and hybrid cars (km) • Fossil fuel reduced by using electric and hybrid cars (litres) • Number of passengers transported by public electric buses • Policy and legal measures taken to increase transport alternatives using electricity • Amount of GHG emission reduced through the policy and legal measures (CO_2-eq (mt/year)	MoT

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
			Reduce passenger and freight transport vehicles by introducing mass passenger and freight transport with long-distance electric railways	Mitigation	• Length of electric railways constructed (km) • Distance traversed through transporting passengers and goods on electric railways (km/month and year) • Amount of GHG emission reduced through using electric mass transport alternatives (CO_2 -eq (mt/year)	MoT
			Decrease pollution in cities by constructing electric bus lanes and railway lines		• Number of passengers transported by public electric buses and trains per year • Number of electric buses and trains per year • Amount of GHG emission reduced through using electric mass transport alternatives (CO_2 -eq (mt/year)	MoT
			Improve transport services		• Distance covered through city express bus transport (km/year) • Number of importing hybrid vehicles • Number of electric vehicle charging stations in the city • Number of standards and guidelines issued for improving transport services • List of actions taken to reduce air and noise pollution • Measures taken to improve road safety and road congestion, includes types • Number of modern parking lots built to decrease road congestion	MoT

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
		Utilization of alternative transport means	Diversify the use of non-powered alternative transport	Mitigation	• Number of people made aware biking as an alternative • Number of people using bikes • Number of people using alternative non-pollutant transport including electric train, bikes, etc. • Number of non-pollutant transport alternatives, includes electric trains, bikes, etc. type	MoT
		Ban import of used cars and tires	Setup a system to ban the import of used cars and tires	Mitigation	• Awareness creation given on banning imported used cars and tires • System setup to ban import of used cars and tires	MoT
		Mainstream climate change risks in road infrastructure system	Create awareness on the risks of climate change	Adaptation and mitigation	• Number of people trained on measures of mitigation and adaptation • List of results obtained through the training • Number of workshops held on climate change and mitigation and adaptation measures and results achieved • Environment-friendly code of road construction and standards • Trees planted and grown through compensation for the damage occurred during road construction (ha)	MoT
		Undertake soil conservation measures around built up infrastructures	Plant environmental friendly grass on roadside embankments	Adaptation	• Newly planted and grown grass/trees (ha)	MoT

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
		Construct retaining walls on roadside embankments			• Roadside protected by retaining walls (ha) • Flood diversion structures and ditches built along roadsides to improve road safety (km)	MoT
		Diversify energy alternatives	Reduce imports and save foreign currency by replacing fossil fuel with ethanol produced as a byproduct from sugar factories		• Amount of ethanol produced from sugarcane and other plants (litres/type) • Amount of ethanol consumed (liters/year) • Amount of foreign currency saved by using ethanol and biodiesel (USD/year) • Amount of GHG emission reduced through using ethanol and biodiesel (CO_2-eq (mt/year)	MoPNG

6

Green cities and buildings

Green cities and buildings

Urban areas are at the center of economic development. The population of urban areas in Ethiopia has been increasing over the years, thus increasing the demand for economic and social services in recent years. Buildings contribute approximately 5 Mt CO_2-eq, accounting to 3% of today's GHG emissions. Main drivers of GHG emissions are related to solid and liquid waste (3 Mt of CO_2-eq) and the use of private off-grid power generators in the cities (2 Mt of CO_2e). Increased frequency of droughts and floods are the major climate risk in urban areas. Increase in hunger and famine as well as increasing rural-urban migration also observed in urban areas in recent years. Solid Waste Management and Climate Resilient Green City strategic documents that help to guide and implement the clean and green city development through community mobilization are among the initiatives developed in the sector for the GTP II implementation.

Table 6. Green cities and buildings

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
6	Green cities and buildings	Undertake environmental and social impact assessment	Set up environmental and social impact assessment system	Adaptation and mitigation	• Number of projects assessed on environmental and social impact • Number of projects approved on environmental and social impact • Number of projects monitored on environmental and social impact	MoUDH
		Improve waste management of cities	Change methane to energy through anaerobic solid waste management	Mitigation	• Area of landfill constructed (ha) • Number of cities that h ave proper landfill • Amount of electricity generated through burning methane (MW) • Number of landfills with evaporator system • Number of landfills in a city with safety structures •Number of garbage sorting and recycling companies	MoUDH

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
			Change methane to energy through anaerobic liquid waste management	Mitigation	• Number of cities with centralized sewage treatment system • Number of cities with effective liquid waste transport facility or decentralized sewage treatment system • List of activities performed to control liquid waste disposal • Amount of energy generated from liquid waste by burning methane (MW)	MoUDH
			Reduce methane through decomposing solid waste to compost	Mitigation	• Amount of compost produced from solid waste (m3/year) • Amount of GHG emission reduced by composting the solid waste (mt/year	MoUDH
			Improve sequestration of GHG emission and protect soil erosion through area closure of deforested watershed, land and gullies	Mitigation	• Number of buildings with green areas • Number and area of green parks (ha by city and region)	MoUDH
		Green cities	Urban greenery development	Adaptation and mitigation	• Area of land developed through improved soil and crop management (ha) • Area of land developed through integrated watershed management (ha) • Number of households benefitting from the extension of agroforestry	MoANR

7

Construction

Construction

An efficient and effective construction industry can enhance national competitiveness and create employment opportunities. Leapfrogging to modern and efficient construction technologies is the basic strategic direction of the government of Ethiopia in building a climate resilient green economy. Among the measures planned during the GTP II period include building the capacity of domestic construction industry, bridging the critical infrastructure gaps with a particular focus on ensuring the quality of infrastructure services by strengthening the implementation capacity of the construction sector, and implementing strict legal measures to safeguard the environment.

Table 7. Construction

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
7	Construction	Building construction	Expanding building construction action plan	Adaptation and mitigation	• No of climate-friendly building construction design • Number of building construction designs that reduce vulnerability to climate change • Number of monitoring and evaluations accomplished to control or prevent environmental pollution from buildings and constructions • Size of rehabilitation work undertaken in quarry (ha/sq km) • Number of building and construction that use engraining and modern technologies	MoUDH

8

Industry

Industry

Industrialization is seen as the engine behind social transformation and modernization, and important for sustainable development. Industrial issues have cross-cutting dimensions that include environment, the economy, and social domains. Environmental constraints to development are acutely felt in the industrial sector in relation to production and consumption of manufactured goods. Given the comparably small share of organized industrial economic activity, industry accounts for only 3% of national GHG emissions. At nearly 2 Mt CO_2-eq or 50% of the 4 Mt CO_2-eq emissions from industry, cement is the single largest source of industrial GHG emissions, followed by mining (32%), and textile and leather (17%) industries. Emissions from steel, other types of engineering, chemicals industry (incl. fertilizer), pulp and paper industry and food processing together account for only about 2% of industrial GHG emissions. However, with the rapid growth of the industrial sector the dangers associated with environmental pollution are eminent. Hence, during the GTP II period proper industrial waste disposal, promotion of green technologies, and implementation of legally binding and strict environmental and social impact assessments should be given due attention to be addressed by the sector.

Table 8. Industry

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
8	Industry	Transform industries with modern and energy efficient technologies	Deploy energy-efficient technologies that reduce energy wastage in cement industries	Mitigation	• Number of manufacturing plants using power-saving technologies and reduced expenses Amount of GHG emission reduced (t of CO_2-eq/year)	MoI
			Reduce GHG emission by completely substituting clinker with pumice	Mitigation	• Number of cement factories with replaced clinker by increasing pumice in cement production No) • Number of cement factories that use plant and agricultural residues to generate energy • Number of cement manufacturing plants introducing new technologies • Amount of GHG emission reduced (mt of CO_2 -eq/year)	MoI

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
			Reduce GHG emission by replacing coal with plant residues and implementing alternative cement production process	Mitigation	• Amount of plant residue used for energy (t) • Amount of GHG emission reduced (mt) CO_2-eq/year) • Number of manufacturing industries that use energy-saving technologies in the production process • Amount of GHG emission reduced (mt CO_2-eq/year)	MoI
			Use technologies that save raw material wastage during the process of production	Mitigation and adaptation	• Number of industries using technologies that reduce raw material wastage • Amount of GHG emission reduced (mt CO_2-eq/year)	MoI
		Implemented environmental and social impact assessment	Industries scrutinized through environmental and social impact assessment	Mitigation	• Number of industries scrutinized through environmental and social impact assessment • Number of industries that prepared and implemented an environmental management plan • Number of existing industries with expired grace periods that have planted and used pollution cleaners	MoI
		Increase the number of biofertilizer factories	Expand existing biofertilizer factories and setup new ones	Mitigation	• Number of newly established bio-fertilizer factories • Number of existing biofertilizer factories that got expansion support • Amount of biofertilizer produced (mt) • Amount of bio-fertilizer used (mt) • Amount of foreign currency saved by replacing chemical fertilizer with bio-fertilizer (USD)	MoI

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
		Import Green technology	Import selected green technologies	Adaptation and mitigation	• Number and types of green technologies imported • Number of institutions and cooperatives that used the imported green technologies	MoI
		Improve industrial waste management	Proper handling and disposal of industrial waste	Mitigation	• Number of plants that replace or minimize industrial waste • Number of industries that recycle and reuse waste (No) • Number of industries that replace chemicals with enzymes	MoI

9

Health

Health

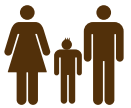
The first African inter-ministerial conference on health and environment held in Libreville, Gabon in 2008 came up with a Libreville declaration that advocates for the promotion of inter-linkage between health and environment. Similarly, the second African inter-ministerial conference on health and environment held in Luanda, Angola in 2010 identified management of environmental and health risks related to climate variability and change among the nine top priorities for African health and environment. Based on this declaration, Ethiopia conducted a situation analysis and a needs assessment of health and environment linkage and produced a country report co-signed by federal MoH and the EPA in 2010 as a succession of African inter-ministerial conference on health and environment. Consequently, federal MoH developed the framework to respond to the urgent need for the health sector in adapting the impact of climate change and aiming to serve as policy guidance by providing a roadmap for the realization of the National Health Adaptation Plan. Increases in temperature and drought frequency and extreme events, including heat waves and storms are among the climate change risks identified by the ministry. The effects of the climate change risks will be manifested through the increase in vector-borne and water-borne diseases, severe malnutrition, and increases in flood incidence and displacement of people. Hence, the GTP II of the health sector emphasizes adaptation measures such as expanding environmental health services through the implementation of changes based on improving environmental and health services in rural and urban areas.

Table 9. Health

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
9	Health	Expanding environmental health service	Improving human health through implementation of environmental health services in rural and urban	Adaptation	• Number of households using toilet in rural and urban • Number of households with modern toilet • Number of households using household economy • Number of households using properly designed solid and liquid waste disposal system • Number of health service provision infrastructures in rural and urban areas • Number of model households benefited and completed health service extension • Number of health service organizations that improved liquid and solid waste disposal system • Number of organizations that established systems for disposal of expired chemical and drugs	MoH

10

Gender, children and youth



Gender, children and youth

Ensuring active participation of women, children and youth in climate change issues is expected to become a practical development approach by all development actors working in various sectors. Women, children and youth are often the most vulnerable to changes in climate. Hence, building social protection and livelihood options is among the priority areas in the Ethiopian National Adaptation Plan. This adaptation plan gives special emphasis to women, children and impoverished communities. Promotion of women and youth empowerment, ensuring their effective participation in development and democratization process and enabling them to equitably benefit from the outcomes of development are among the basic directions of GTP II.

Table 10. Gender, children and youth

No	Sector	Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
10	Gender, child and youth	Improving gender equity and childcare	Mainstreaming gender and child agenda	Adaptation	• Number of organizations in which gender equity and childcare are mainstreamed to prevent the influence caused by climate change • Number of women organized and involved in different projects to address climate change • Type and number of projects in which women are involved	MoWCY
		Improving benefits of youth	Organizing youth and let them benefit from participation and promotion of climate change issues		• Number of youth organized into green technology options? and benefited in different projects to address climate change • Type and number of projects in which youth participate or are involved • Participation and share of youth in climate change adaptation and environmental management • Number of youth involved in environmental protection and related work by region urban/town	

11

Labor and social affairs

Labor and social affairs

The main strategic direction to be pursued in this sector is to ensure disabled and elderly people receive equal social and economic benefits by conducting different studies and research, establishing a social welfare system and expanding social security services to benefit vulnerable groups in society. During the GTP II period, there is a plan to increase legal frameworks and implementation guidelines that increase social welfare schemes and increase the number of beneficiaries. Moreover, provision of technical support for waste disposal and management that safeguards the working environments around industries is a focus for the sector during this period.

Table 11. Labor and social affairs

No	Sector	Major adaptation options	Detailed activities	Strategy	Indicator	Implementing sector
11	Labor and social affairs	Enhance citizens' benefits through setup of social protection system at different levels	Undertake preliminary assessment to decrease the impact of climate change on citizens with disabilities or difficult circumstances	Adaptation	• Number of preliminary assessment studies of resilience against climate change impact	MoLSA
			Create awareness of beneficiaries of social protection services on the causes of air pollution and its impact		• Number of people aware of climate change risks	MoLSA
		Strengthen the safety of organizations' working environment	Provide technical support on waste disposal and management to safeguard the environment around industries	Adaptation and mitigation	• Number of organizations that got technical support on safe working environment and cleaner production • Number of organizations that included safe working environment and cleaner production in their plan and implementation • Number of employers and employee associations getting technical training on safe working environments and cleaner production • Number of safety committees established	MoLSA

12

Disaster prevention

Disaster prevention

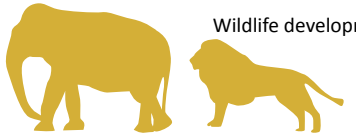
Establishing resilient systems that can withstand disasters and risks related to climate change through building collaborative partnerships among the relevant stakeholders and enhancing thematic integration among different development sectors are among the long-term adaptation objectives of the Ethiopian National Adaptation Plan. Strengthening climate change risk insurance mechanisms, improving early warning systems, and safety nets are among the major adaptation options in the GTP II period. These options will promote preparedness related to risk reduction and create insurance schemes for anticipated climate risks, including droughts and floods that lead to crop failure. Moreover, improving early warning systems will enhance planning for disaster and climate risk management; reinforce early warning systems related to both quick and slow onset disasters; and install knowledge management system, climate information exchange systems and enhanced networking capabilities that are all vital for effective data sharing and decision making.

Table 12. Disaster prevention

No	Sector	Major adaptation options	Detailed activities	Strategy	Indicator	Implementing sector
12	Disaster prevention	Increase environmental or climate change disaster insurance schemes	Developing insurance schemes against climate change disasters at different levels	Adaptation	• Number of disaster insurance systems established to adapt to climate change • Types of disaster insurance systems established	DRMFS NDPC
		Modernizing disaster early warning and responsive system, and increase coverage of farmers and pastoralists	Strengthening climate information, research and institutional linkages and cooperation	Adaptation and mitigation	• Number of early warning and responsive systems established for climate change adaptation • Number of climate change early warning and responsive information systems organized and periodically addressed • Number of households benefitting	NDPC
		Safety net, humanitarian assistance, and care for environmental refugees	Identification of areas prone to disaster, number of refugees and provide care	Adaptation	• Number of environmental refugees • Types of care provided to them	NDPC IRA

13

Wildlife development
and protection



Wildlife development and protection

Climate change poses a fundamental threat to places, species and people's livelihoods. Improving ecosystem resilience through conserving biodiversity enhances the natural resilience to the adverse impacts of climate change by nurturing healthy and well-functioning ecosystems. This option uses biodiversity conservation including agro-biodiversity and ecosystem services as an overall adaptation strategy. Diverse ecosystem conservation including mountains, watersheds, dry forests, tropical high forests and rangelands is vital for the well-being of diverse wildlife fauna and flora.

Table 13. Wildlife development and protection

No	Sector	Major adaptation options	Detailed activities	Strategy	Indicator	Implementing sector
13	Wildlife development and protection	Safeguard the of protection forests	Enhance and strengthen the management of Protection Forests	Adaptation	• Forests in national parks and wildlife protected areas (ha) • Managed forest in national parks and wildlife protected areas (ha) • Environmental, social, and economic benefits of protected forests in the national parks and protected wildlife areas • Number of households benefitting (disaggregated by gender) • Amount of GHG emission sequestered by protected forests in national parks and protected wildlife areas (CO_2-eq (t/year)	MoCT (WLDPA)
			Improve water supply and health for the wildlife		• Number of infrastructure built in national parks and protected wildlife areas to improve wildlife water supply • Number of infrastructures built in national parks and protected wildlife areas to improve wildlife health	MoCT (WLDPA)

14

Education

Education

The scope of the Ethiopian National Adaptation Plan embraces, the education sector amongst other sectors. In this sector, promotion of environmental education and green technology innovation have been prioritized during the GTP II period. Environmental education increases public awareness and knowledge about environmental issues and problems. In doing so, it provides the public with the necessary skills to make informed decisions and take responsible action. Reducing global GHG emissions and protecting environmental assets will require innovation and large-scale adoption of green technologies. Without innovation, it will be very difficult and very costly to sustain current growth trajectories while addressing major environmental issues such as climate change.

Table 14. Education

No	Sector	Major adaptation options	Detailed activities	Strategy	Indicator	Implementing sector
14	Education	Boost environmental education in formal and informal schools	Ensure inclusion of environmental education in the curriculum of formal schools from KG up to high school, higher education and informal schools, such as adult education and Technical and Vocational Education and Training centers	Adaptation	• Number of subjects that included environmental education in KGs and primary schools (quality/depth) • Number of higher learning institutes where environmental education is given as a separate subject • Number of adult education and technical vocational training institutions where environmental education is included in their curriculum and given as a subject	MoE
		Promote green technology innovation	Strengthen green technology innovation in Technical and Vocational Education and Training centers to create access to the society	Adaptation and mitigation	• Number of Technical and Vocational Education and Trainingcenters that have green technology innovation • Number and type of green technologies promoted through the extension services (No/Type) • Number of institutes and cooperatives using green technologies innovated by TVETs	NDPC

Annexes

Annexes

Annex I: Soil and livestock

Measures to be taken	Annual GHG emission reduction, Mt CO_2-eq /year					Coordinating sector
	2016	2017	2018	2019	2020	
Diversification of animal mix toward poultry	5.30	6.19	7.07	7.96	8.84	MoLF
Pastoralist animal value chain efficiency	1.63	1.87	2.10	2.34	2.58	MoLF
Small-scale mechanization	2.18	2.56	2.91	3.27	3.64	MoANR
Farmer value chain efficiency improvement	3.36	3.92	4.48	5.04	5.60	MoLF
Large-scale mechanization/tractor	1.17	1.37	1.57	1.76	1.96	MoANR
Rangeland and pastureland management	0.80	0.93	1.06	1.19	1.33	MoLF
Expansion of low emitting technologies	8.90	11.13	13.36	15.58	17.81	MoANR
Total amount of abatement	22.35	27.95	32.55	37.14	41.74	

Annex II: Forestry

Measures to be taken	Annual GHG emission reduction, Mt CO_2-eq /year					Coordinating sector
	2016	2017	2018	2019	2020	
Increase improved cook stoves dissemination	10.29	12.01	13.73	15.44	17.16	MEFCC
Yield intensification	27.20	27.20	27.20	27.20	27.20	MoANR
Increase biogas stoves dissemination	0.70	0.81	0.93	1.04	1.16	MoWIE
Increase electric stoves dissemination	4.20	4.91	5.61	6.31	7.01	MoWIE
Expand small scale irrigation development	1.96	1.96	1.96	1.96	1.96	MoANR
Forest management	1.95	2.27	2.60	2.92	3.24	MEFCC
Woodlands management	0.97	1.14	1.30	1.46	1.62	MEFCC
Afforestation and reforestation	9.68	11.29	12.90	14.51	16.13	MEFCC
Expand large scale irrigation development	8.64	8.64	8.64	8.64	8.64	MoWIE
Increase LPG stoves dissemination	0.18	0.21	0.24	0.24	0.29	MoPNG
Total amount of abatement	65.77	70.43	75.09	75.09	84.41	

Annex III: Industry

Measures to be taken	Annual GHG emission reduction, Mt CO_2-eq /year					Coordinating sector
	2016	2017	2018	2019	2020	
Cement	5.49	6.09	6.69	7.29	7.90	MoI
Chemicals	0.04	0.06	0.09	0.11	0.14	MoI
Fertilizer	0.72	0.85	0.98	0.11	1.23	MoI
Hide and skin	0.04	0.04	0.05	0.05	0.06	MoI
Minerals	0.05	0.06	0.06	0.07	0.08	MoI
Others	0.00	0.00	0.00	0.00	0.00	MoI
Paper and paper products	0.06	0.06	0.06	0.06	0.06	MoI
Textile	0.44	0.49	0.54	0.60	0.65	MoI
Total amount of abatement	6.83	7.65	8.47	9.29	10.11	

Annex IV: Green Cities

Measures to be taken	Annual GHG emission reduction, Mt CO_2-eq /year					Coordinating sector
	2016	2017	2018	2019	2020	
Solid waste management in landfills	0.19	0.25	0.13	0.37	0.43	MoUDH
Liquid waste management	0.24	0.31	0.37	0.44	0.51	MoUDH
Waste management of residential buildings	0.33	0.56	0.78	2.00	2.22	MoUDH
Waste management of business buildings	0.18	0.21	0.25	0.28	0.31	MoUDH
Total amount of abatement	0.52	0.77	2.03	2.28	2.53	MoUDH

Annex V: Energy

Measures to be taken	Annual GHG emission reduction, Mt CO_2-eq /year					Coordinating sector
	2016	2017	2018	2019	2020	
Export electricity power	6.37	11.08	15.80	20.52	25.23	MoWIE
Total amount of abatement	6.37	11.08	15.80	20.52	25.23	

Annex VI: Transport

Measures to be taken	Annual GHG emission reduction, Mt CO_2-eq /year					Coordinating sector
	2016	2017	2018	2019	2020	
Improve fuel efficiency standards	0.13	0.17	0.21	0.26	0.30	MoT
Increase electric rail	1.31	1.59	1.87	2.15	2.43	MoT
Expansion of B5 fuel blend	0.14	0.16	0.18	0.20	0.22	MoT
Expansion of E15 fuel blend	0.06	0.07	0.07	0.08	0.09	MoI
Expansion of light rail transit	0.03	0.04	0.04	0.04	0.05	MoT
Expansion of bus rapid transit	0.01	0.01	0.01	0.01	0.02	MoT
Hybrid vehicles	No emission reduction before 2020					
Expansion of plug-in electric vehicles	No emission reduction before 2020					
Total amount of abatement	1.69	2.39	2.39	2.74	3.09	

Organizations

Federal Government of Ethiopia

Climate Resilient Green Economy Strategy

Sector-wise GTP II Implementation Monitoring Checklist