Ethiopia's First Biennial Update Report (FBUR)

Under the United Nations Framework Convention on Climate Change (UNFCCC)

FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

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Addis Ababa, Ethiopia

FOREWORD

On behalf of the Federal Democratic Republic of Ethiopia, I am honoured to present our country's First Biennial Update Report to the United Nations Framework Convention on Climate Change (UNFCCC). Ethiopia has been a party to the UNFCCC since 1994, and the Kyoto Protocol since 2005, as well as to the Paris Agreement since 2017, demonstrating our commitment to global efforts in addressing climate change. As part of our commitments, we are submitting this report in accordance with the requirements of the UNFCCC.

Ethiopia believes ensuring the implementation of the Paris Agreement is not an option. We must collectively strive for our common future in combating the adverse effects of climate change. The contribution of Ethiopia to the cause of the global climate change is insignificant. Yet, Ethiopia has been carrying out various practical policy and action interventions as a step to contribute to emission reduction and building adaptation capacity.

Ethiopia was amongst the first countries that chartered a Climate Resilient Green Economy strategy in 2011 well ahead of the world come out with common climate accord in Paris in 2015. Besides Ethiopia formulated the National Adaptation Plan (NAP) in 2017 to build and boost the resilience and adaptation capacity. Ethiopia recognized the climate change as one of the critical challenges that needs urgent action. Recognizing this fact, Ethiopia has well considered building climate resilient green economy as one of the pillars of the 10-Year National Development Plan. Furthermore, Ethiopia has further strategically considered the issue by launching the Long-Term Low Emission and Climate Resilient Development Strategy (LT-LEDS) that runs from 2021 to 2050.

Ethiopia has been walking the talk by translating its ambitious strategies into action through significantly addressing the climate change with home grown initiatives with our own resources. Our Green Legacy Initiative (GLI) Launched in 2019, aimed to plant about 20 billion seedlings by 2022. Yet, this national flagship program has succeeded to plant 25 billion seedlings on the degraded landscapes of Ethiopia by mobilizing more than 21 million volunteers throughout the nation while it creates more than 180,000 jobs. In addition, the government has been scaling up and scaling out the GLI into food fruit bearing perennial trees to directly linking the initiative with our food system transformation strategy.

The government of Ethiopia recognizes attaining food and nutrition security is a constitutional and human right of Ethiopians. Accordingly, National Wheat Production initiative is being in the implemented to benefit Ethiopia from a wide range of agro-ecological zones, facilitating the cultivation of various crops and the rearing of diverse livestock. The Government of Ethiopia is considering the year-round production using the available rainfed agriculture while promoting dry season irrigation across the country. The success in wheat production is crucial for the country's effort to enhance food security and achieve food sovereignty. An enhanced wheat production is meant for building a food system that withstands shocks whereby enhance resilience of our community to climate change.

Ethiopia is also investing on green energy projects such as hydroelectric, wind, solar and geothermal energy sectors, as well as promoting modern rural fuel-efficient cooking technologies. Ethiopia successfully managed the hydro energy producing projects including the Grand Ethiopian Renaissance Dam (GERD) with domestic resources which will significantly make difference in the country's status in terms of social, environmental including significantly reducing GHG and economic terms.

To ensure effective implementation of the Paris Agreement's Enhanced Transparency Framework, Ethiopia has taken preparatory measures for a smooth transition. We have previously prepared the First, Second, and Third National Communications in line with the Convention's requirements.

Ethiopia's First Biennial Update Report covers the period from 2018 to 2020, providing information on our national circumstances, greenhouse gas inventory, mitigation assessment, adaptation, and other relevant information. It includes sectors such as Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forest and Other Land Use (AFOLU), and waste. The report also highlights our mitigation actions and their effects, as well as capacity needs and constraints.

This report represents another step forward in our pursuit of green and sustainable development at all levels. We will continue to collaborate with national and international partners to pursue a decarbonized, resilient, and inclusive path that we have already embarked upon since ratifying the Convention.

In conclusion, while Ethiopia is taking proactive measures at the national level to mitigate and adapt climate change, we emphasize the need for concrete international actions and support. We call for reforms to streamline access to climate finance, which would supplement national funding for climate change-related initiatives.

H.E. Dr Fitsum Assefa,

Minister, Ministry of Planning and Development

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ABBREVIATIONS AND ACRONYMS

AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business as Usual
BRT	Bus Rapid Transport
BUR	Biennial Update Report
CAT	Climate Action Tracker
CDM	Clean Development Mechanism
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2eq	Carbon dioxide equivalent
COP/CP	Conference of Parties
CRGE	Climate Resilience Green Economy Strategy
ECPI	Ethiopian Cities Prosperity Initiative
EEU	Ethiopian Electric Utility
EEPCo	Ethiopian Electric Power Corporation
EF	Emission Factor
EGII	Ethiopian Geospatial Information Institute
EPA	Environmental Protection Authority
ERA	Ethiopian Roads Authority
ESS	Ethiopian Statistical Service
ETF	Enhanced Transparency Framework
FAO	Food and Agriculture Organization
FBUR	First Biennial Update report
FDRE	Federal Republic of Ethiopia
FREL	Forest Reference Emission Level
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GOE	Government of Ethiopia
GERD	Great Ethiopian Renaissance Dam
GPG	Good Practice Guidance

GTP I & II	Growth and Transformational Plan
GWPs	Global Warming Potentials
ICA	International Consultation and Analysis
IEA	International Energy Agency
INDC	Intended Nationally Determined Contribution
IP	Industrial Park
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Process and Product Use
LULUCF	Land Use, Land-Use Change and Forestry
M&E	Monitoring and Evaluation
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MoI	Ministry of Industry
MoM	Ministry of Mines
MoTL	Ministry of Transport and Logistics
MoPD	Ministry of Plan and Development
MoUID	Ministry of Urban and Infrastructure Development
MoWE	Ministry of Water, and Energy
MOU	Memorandum of Understanding
MRV	Measurement Reporting and Verification
MSW	Municipal Solid Waste
N_2O	Nitrous oxide
NA	Not Available
NAMAs	Nationally Appropriate Mitigation Actions
NAP	National Adaptation Plan
NAP-ETH	National Adaptation Plan 2017
NC	National Communication
NCV	Net Calorific Value Not Estimated
NDC	Nationally Determined Contribution
NE	Not Estimated
NH_3	Ammonia
NGHGi	National Greenhouse Gas Inventory
NGOs	Non-Governmental Organizations
NMVOC	Non-methane Volatile Organic Compound
PoA	Program of Activities

QA/QC	Quality Assurance/Quality Control
REDD+	Reduction Emission from Deforestation and Forest Degradation Plus
RSDP	Road Sector Development Program
SDG	Sustainable Development Goal
SNC	Second National Communication
SSGI	Space Science and Geospatial Institute
SWDS	Solid Waste Disposal Sites
TACCC	Transparent, Accurate, Complete, Consistent and Comparable
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary Carbon Market
VERs	Verified Emission Reductions

1 EXECUTIVE SUMMARY

National Circumstances

Ethiopia covers a total surface area of 1,136,242 km², lying between the Equator and the Tropic of Cancer, with latitude ranging from 3°N to 15°N and longitude ranging from 33°E to 48°E. The population of Ethiopia in 2020 was estimated to be 114 million, representing a 55.1 percent increase compared to 73.5 million in 2007. Approximately 78% of the population lives in rural areas, while 22% resides in urban areas (World Bank, 2021b).

The climate of Ethiopia is primarily influenced by the seasonal migration of the Intertropical Convergence Zone and is also affected by atmospheric circulations and the topographic features of the country. The topographic diversity results in different climates across the country, leading to variations in temperature and precipitation patterns. The minimum mean temperature during the coldest season in Ethiopia is 6°C, while the maximum mean temperature rarely exceeds 26°C in the central plateau. In the highlands, temperatures can reach as low as -15°C, while in the lowlands, it typically exceeds 25°C, occasionally reaching a high of 60°C.

Ethiopia experiences three rainfall seasons, locally named Kiremt, Belg, and Bega. Kiremt is the primary rainy season, occurring from mid-June to mid-September, and most parts of the country receive rainfall during this period. Kiremt accounts for 50-80% of the annual rainfall in Ethiopia.

Ethiopia is characterized by a massive highland complex of mountains and plateaus divided by the Great Rift Valley and surrounded by lowlands along the periphery. The diversity of the terrain is fundamental to regional variations in climate, natural vegetation, soil composition, and settlement as well as livelihood patterns.

Regarding land use, in the year 2018, Ethiopia's land was categorized as follows: arable land (14.3%), permanent cropland (1.5%), forest land (15.1%), permanent pastureland (20%), and other lands (50.9%) (FAOSTAT, 2019).

Ethiopia's natural ecosystem is divided into ten distinct ecosystems based on vegetation types, including Afro-alpine and Sub Afro-Alpine, Montane Grassland, Dry Evergreen Montane Forest and Evergreen Scrub, Moist Montane Forest, Acacia-Commiphora Woodland, Combretum-Terminalia Woodland,

Lowland Tropical Forest, Desert, Semi-desert Shrubland, Wetland, and Aquatic Ecosystem (IBC, 2009). These ecosystems are located in various topographies, harbouring unique and diverse biological resources.

Ethiopia has one of the world's fastest-growing economies, with an average annual growth rate of 8.7% from 2010 to 2023 (MoPD, 2023). The gross domestic product (GDP) growth rate was 10.2% from 2010 to 2015 but decreased to 7.6% from 2016 to 2023. Based on the current market price, the Ethiopian economy has experienced an average annual growth rate of 26%, with the nominal GDP increasing from Birr 395.9 billion to Birr 8.72 trillion from 2010 to 2023 (MoPD, 2023),). However, Ethiopia's GDP growth slowed down to 6.5% in average from 2020 to 2023 due to global and domestic shocks

The GDP per capita increased from $389 in 2009/10 to $ 1549in 2022/23.It is expected to further increase to $2,220 with an annual growth rate of 8.2% by 2030 (PDC, 2021). The main economic sectors in Ethiopia include agriculture, forestry and fishing, the textile industry, minerals and mining, energy, manufacturing, tourism, and telecommunications. Agriculture dominates the country's economy, contributing to almost half of Ethiopia's GDP in 2010. In 2023, the agriculture, industry, and service sectors contributed approximately 32.1%, 28.8%, and 40.3%, respectively, to the country's GDP. The ongoing economic structural transformation aims to accelerate the country's economic growth and significantly increase the industry's and service sector's contribution to the GDP by 35.9% and 42.1%, respectively. However, it is predicted that the agricultural sector's contribution will decrease to 22% by 2030 (PDC, 2021).

Ethiopia possesses abundant renewable energy resources, including hydro, wind, solar, geothermal, and biomass. Despite generating over 60,000 megawatts (MW) of electric power (EEPCo, 2021), approximately 55.2% of the population lived without access to electricity in 2019 (World Bank, 2019). The country heavily relies on traditional biomass energy, such as fuelwood, charcoal, and dung cakes, for household purposes. Waste and biomass account for the largest energy sources.

Ethiopia has one of the enormous forest resources in the Horn of Africa. The country's economic growth requires an increase in forest resources, including wood products for construction, furniture, electrification, and the pulp and paper industry. Furthermore, non-timber forest products such as bamboo, honey, forest coffee, fodder, gum and resin, beeswax, and traditional medicinal herbs are important sources of livelihood for local forest-dependent communities. Coffee contributes 5% of GDP and 30% of export earnings, honey earns an annual income of above $60,000, and bamboo contributes $2 million in revenue. The country exports small quantities of various wood products, including poles, veneer, swan wood (high volume and value), furniture, fuelwood/charcoal, and chip wood. Among these products, poles (536m^3/year), veneer

(437 m^3/year), sawn wood (28,982 m^3/year), furniture (98 tons/year), fuelwood/charcoal (56m^3/year), and chip wood (21 m^3/year) are the main exports. Sawn wood is the product of high volume and value in terms of export (Forest Sector Review (FSR), 2015). The domestic wood industries serve both the local and international markets. Their production, excluding furniture, was estimated to be in the value range of ETB 62.8 million in 2005 to ETB 163.8 million in 2009, registering an average annual growth rate of 27.1%. Out of this, products valued at about ETB 19.3 million were exported, while the balance, supplemented with imports, was consumed in the local market. With population growth and economic development projections, the total wood product demand will increase by about 27% over the next 20 years, reaching an annual consumption of 158 million m^3 by 2033 (EFCCC, 2020). Ethiopia's National Forest Inventory, which lasted from 2018–2020, regrouped the classes into five biomes: Acacia-Commiphora woodland, Combretum-Terminalia woodland, Dry Afromontane, Moist Afromontane forests, and others (Ministry of Environment, Forest, and Climate Change (MEFCC), 2018). Forest resources management provides multi-allied benefits since forests are the source of multi-essential ecosystem services, including carbon sequestration, crop pollination, conservation of agricultural soils, and water discharge control to streams and rivers. Moreover, forested land is essential for about two-thirds of our drinking water. In general, there are eight major categories of forest land best management practices (BMPs), including pre-harvest planning, streamside management zone, forest wetlands protection, road construction and maintenance, timber harvesting, re-vegetation, fire management, and forest chemical management.

The Ten year Development Plan identified focus area of development into three groups: (i) productive sectors (agriculture, manufacturing, and mining), (ii) service sector (the tourism industry), and (iii) enabling sectors (energy, transport, sustainable finance, innovation and technology, urban development, irrigation, and human capital development) (MoPD, 2021). Furthermore, the country will follow a multi-sectoral growth approach by diversifying economic growth and job creation sources through necessary and substantive policy reforms across the different sectors. In this context, attention has been given to the agriculture, manufacturing, mining, tourism, and ICT sectors.

Ethiopia implemented the Millennium Development Goals (MDGs), integrating them into its national development framework and registering remarkable achievements in the period 2000 to 2015. Six of the eight MDGs were successfully achieved (NPC, 2017). The MDGs were implemented through effective government leadership and coordination of all stakeholders in an organized and structured manner. Important lessons have been drawn at the national level, enabling Ethiopia to make significant contributions to the preparation of the 2030 Global Agenda for SDG. Ethiopia has also undergone the voluntary SDG

Assessment and progressed well across different intervention areas. The GOE mentioned the following challenges in the ten-year prospective development plan: lack of synchronization of investment with resource potentials and development needs, poor alignment of federal, regional, and district-level investment plans with the national development goals and envisioned settlement patterns, poor regional coordination due to low consideration for trans-regional and spatial issues in development plans of regional states, and inter-regional and intra-regional disparities in infrastructural development and access to services (PDC, 2021).

Climate change is a fundamental development issue for Ethiopia as its impacts could slow the country's development process. Mitigation strategies include promoting climate smart agriculture and forest development as well as sustainable landscape management, retrofitting buildings to make them more energy-efficient, adopting renewable energy sources like solar, wind, and small hydro, helping cities develop more sustainable transport such as bus rapid transit, electric vehicles, and promoting biofuels for more sustainable uses of land and forests. To be sustainable and implemented on a broad scale, climate change mitigation must be integrated or "mainstreamed" into the policy apparatus of governments and so that Ethiopia’s ten year development plan recognized building climate resilient and green economy as one of its key pillars.

The ten-year development plan, the government gives particular emphasis to a climate-resilient green economy, stating as follows (PDC, 2021): increase basin development efforts to fight land degradation and reduce pollution, improve productivity and reduce GHG emissions, increase forest protection and development, increase production of electricity from renewable sources for domestic use and export, and focus on modern and energy-saving technologies.

Ethiopia is a signatory to various multilateral and bilateral international environmental conventions and protocols and has developed various plans and strategy documents for climate change response.

National Greenhouse Gas Inventory

The National Greenhouse Gas Inventory (NGHGI) of Ethiopia's FBUR covers the years 2018 and 2020. In accordance with the IPCC 2006 guidelines for national greenhouse gas inventory, sources of emission and removal by sinks of four sectors have been covered: Energy (including Transport), Industrial Processes and Product Use (IPPU), Agriculture, Forestry and Other Land Uses (AFOLU), and Waste. The gases covered in this inventory include the major gases carbon dioxide (CO_2), methane (CH_4), hydrofluorocarbons

(HFCs), and nitrous oxide (N_2O). The methodology used was based on the 2006 IPCC Guidelines and the 2003 Good Practice Guidelines. The 2006 IPCC Software and Emission Factor Database were used in preparing the inventory. Activity data used for the energy sector emissions estimates were obtained from the International Energy Agency (IEA) and concerned sectors. The National Gross Domestic Products (GDP) data were collected from the Ministry of Planning and Development. In addition, national data on population, livestock species (the number of animals produced annually (NAPA)), fertilizer application, area of crop cultivation, and crop production were collected from the Ethiopian Statistics Services. Tier 1 methods were used to estimate emissions for the energy, IPPU, waste, and livestock sectors, whereas Tier 2 methods were used for forest sector GHG emission calculations.

Ethiopia's total emissions were estimated to be 350,843.9 $GgCO_2eq$ in 2018 and 262,384.50 $GgCO_2eq$ in 2020. The AFOLU sector was the most significant source of emissions for three gases (CO2, CH4, and N2O), accounting for 82.5% of the total emissions in 2020. The GHG emission decreased by 88,459.4$GgCO_2eq$ (33.7%) from 2018 to 2020. The energy sector was the second emission source, accounting for 12.27%. The contribution from the IPPU and waste sectors was 1.68% and 3.55%, respectively.

Emissions by gas in 2020, expressed in terms of CO_2 equivalents, were CH_4, CO_2, and N_2O contributing 29.18%, 66.20%, and 3.83% of the total emissions, respectively. At the subsector level, most of the CO_2 emissions were from land use change, and CH_4 emissions were mainly from livestock. According to Approach 1 Level Assessment, key category analysis was done using approach 1 (level assessment) and trend assessment. For 2020, eleven sources that contributed to 95% of the total emissions were identified as key categories using the level assessment. Most of the categories identified as keys are from the AFOLU sector, which shows the importance of this sector in the country's inventory.

The GHG inventory of this report was done in line with the TACCC principles and the Enhanced Transparency Framework (ETF) of the Paris Agreement (PA). Based on the current constraints, gaps, and other challenges encountered during the preparation of the present National GHG inventory of NC3, a list of improvement plans has been identified and indicated in this document. Some of these have been addressed during the preparation of the national GHGI within the framework of the next 4th NC. However, most of the items, such as going to a higher tier for the key category of other sectors (energy, IPPU, and waste), still need further improvement, and it is planned to address them during future inventory cycles and within the framework of the next reporting, in addition to the UNFCCC project providing support for the development and operationalization of the Greenhouse Gas Inventory Management System.

Cost of Mitigation Actions

Numerous projects have been implemented in various sectors for climate change mitigation and co-adaptation. The water and energy sector has the highest number of projects, followed by the forestry and agriculture sector, moreover, there are also projects implemented in other economic sector like transport urban and city, and industry sectors to mitigate the GHG emission in country.

When considering the type of climate impact across these 224 projects based on the Ethiopia's Climate Resilient Green Economy (CRGE) Strategy (2011-2019) – Implementation Progress Assessment Report, which have a total value of approximately USD 82 billion, it is found that there are slightly more adaptation projects (97) than mitigation projects (74). There are 53 projects that are considered to have approximately equal impacts on adaptation and mitigation. However, in terms of project value, mitigation projects have the highest total commitment than Projects with both adaptation and mitigation aspects and adaptation projects.

Between 2011 and 2019, a large proportion of mitigation and adaptation activities in Ethiopia took place in the agriculture sector, focused on soil and crops, as well as in the livestock, energy, transport and water sectors, among others. These included large flagship resilience projects such as the Green Legacy Initiative, Productive Safety Net Programme (PSNP), the Agricultural Growth Programme (AGP), the Sustainable Land Management Programme (SLMP), and the Participatory Small-scale Irrigation Development Project (PASIDP), REDD+ initiatives, hydro dams including the Ethiopian Great Renaissance Dam (GERD), amongst others. Besides, there are also a number of development partners supported initiatives.

Constraints/ Gaps, and Support Needed and Received

Constraints and Gaps

Like many developing countries, Ethiopia faces several challenges in implementing, mitigating, and adapting to climate change. This section highlights the constraints and gaps identified during the development of the FBUR and the National Inventory System. The encountered gaps and constraints

include institutional capacity gaps related to financial, technological, knowledge, and systems needed to handle reliable, disaggregated data and information from all sectors of the economy. There is a lack of country-specific emission factors (Tier 1 methods are mostly used), as well as the absence of a fully operational information management system for GHG emissions compilation. The IPCC GHG inventory software was found to be inflexible in incorporating nationally available data such as soil classification and tends to categorize the entire country under one climate zone, despite Ethiopia's diverse agroecology. Limited adoption of practices and technologies, despite their potential benefits for adaptation, productivity increase, and mitigation efforts, is another constraint. Lack of awareness and clear policy are significant barriers to the successful transfer of technologies.

Support Needed and Received

Ethiopia receives significant financial aid from bilateral and multilateral partners to implement its prioritized national climate change mitigation and adaptation policies. The government of Ethiopia acknowledges the support received from these partners in addressing the impacts of climate change. From 2011 to 2019, with guided by the World Bank's categorization of activities with adaptation and mitigation co-benefits, Ethiopia has invested approximately USD 82 billion, mobilized from domestic, bilateral, multilateral sources, and international climate finance institutions. The vast majority of finance spent on these identified climate change-related projects implemented between 2011 and 2019 are from Ethiopian public funds, with the second largest source being international aid, and private sector finance plays insignificant role.

Ethiopia has submitted an ambitious (Intended) Nationally Determined Contribution) in 2015 and updated Nationally Determined Contribution (NDC) in 2021, with a conditional pledge to reduce GHG emissions by 64% and 68.8% by 2030, respectively, compared to the 2010 level business-as-usual projection. This target is significantly higher than the previous NDC. The implementation of the updated NDC requires a total of $316 billion, with 80% of the funding expected to be mobilized from international climate finance sources. The remaining cost will be financed domestically.

2 NATIONAL CIRCUMSTANCES

2.1 Introduction

This chapter provides information on Ethiopia's national circumstances up to the year 2020, including relevant geography, natural resources, social and economic published statistics. It also communicates the status of key climate-related sectors and their respective policies and strategic measures. The information provided here is consistent with the information presented in the 3rd National Communication of Ethiopia.

2.2 Governance

The Federal Democratic Republic of Ethiopia has a constitutional federal governance system that has established a parliamentary governance structure. The constitution allows for the establishment of autonomous administrative regional states, granting them decision-making power over regional matters. Currently, the Federal Republic of Ethiopia consists of 12 autonomous regional states and two chartered city administrations. Both the federal government and regional state governments have their respective branches of the three main branches of government.

The highest executive power at the federal level is held by the Prime Minister and the Council of Ministers. The Prime Minister serves as the chair of the Council and also holds the position of Commander-in-Chief of the National Armed Forces. The President, on the other hand, serves as the Head of State. The Federal Supreme Court holds the highest judicial authority as an independent judiciary body. The House of Peoples Representative is the legislative body who is responsible for enacting the Laws of the country. The President and Vice President of the Court are nominated by the Prime Minister and appointed by the House of People's Representatives.

The governance framework of the executive body of the government consists of 22 Ministries, as well as numerous agencies, commissions, and authorities. One of these entities is the Federal Environment Protection Authority (EPA), which plays a crucial role in regulating the execution of environmental agreements at the national level. The Ministry of Planning and Development serves as the focal point for the United Nations Framework Convention on Climate Change (UNFCCC) and responsible body for the overall coordination and monitoring and evaluation of climate policy and actions in Ethiopia where EPA and other line ministries reporting directly to it. Additionally, regional state administrations share the responsibility of coordinating, overseeing, and evaluating the implementation of these agreements within the decentralized structure at their administration jurisdictions.

2.3 Geographic Profile

Ethiopia is a landlocked country located in East Africa, bordered by Eritrea to the north, Djibouti and Somalia to the east, Sudan and South Sudan to the west, and Kenya to the south. According to the FAOSTAT (2019) report, the country covers an area of approximately 1,136,242 km². Geographically, it lies between the Equator and the Tropic of Cancer, spanning between 3°N and 15°N latitude and 33°E and 48°E longitude. The physical-geographic features of the country include rugged mountains, flat-topped plateaus, deep gorges, and river valleys. The highest point is Ras Dashen, reaching an altitude of 4,620 meters above sea level, while the lowest point is the Danakil Depression at 126 meters below sea level. In 2018, the land use in Ethiopia consisted of arable land (14.3%), permanent cropland (1.5%), forest land (15.1%), permanent pastureland (20%), and other lands (50.9%) (FAOSTAT, 2019). Figure 2-1 shows a map of Ethiopia.

Figure 2-1: Ethiopia's physical map

Ecosystems and Their Status

According to the recent national assessment and re-classification of ecoregions, Ethiopia has five distinct types of ecosystems: mountain ecosystems, forest and woodland ecosystems, aquatic and wetland

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ecosystems, rangeland ecosystems, and agroecosystems. The estimated area coverage of these ecosystems is as follows: rangeland ecosystems cover about 69% of the country's total area, forest and woodland ecosystems cover 15-27%, and agroecosystems cover 9.2-22%.

The trend and status of each ecosystem has been assessed, and the findings suggest a continuous decline in area coverage and degradation of habitat quality. The status of each major ecosystem is described below:

Mountain ecosystems: The area coverage of important vegetation types in mountain ecosystems has declined. Many endemic flora and fauna in these isolated mountain ecosystems have been classified as critically endangered by the IUCN Red List Criteria. Land use and land cover change, increased climate variability, and population pressure are the direct and indirect drivers of this change. Agricultural cultivation and overgrazing are encroaching on the steep slopes in the high-altitude range, making this ecosystem highly vulnerable to the adverse impacts of climate change.

Forest and woodland ecosystem: This vast ecosystem comprise various vegetation types distributed in agro-climatic gradients, ranging from lowland woodlands to high mountain tropical forests. Deforestation and forest degradation have been widespread, posing threats to biodiversity. Protected areas within this ecosystem are experiencing extreme anthropogenic pressure and becoming more vulnerable. Natural habitats are continuously deteriorating, resulting in a decline in flora and fauna. Despite this, the Government of Ethiopia gives due attention for forest development through the Green Legacy Initiative and REDD+ programs among others in halting the aforementioned challenges resulting improvements quality and quantity forest and other ecosystems.

Aquatic and wetland ecosystem: The wetland and aquatic ecosystem in Ethiopia is a biodiversity hotspot, hosting at least 10% of Ethiopian floral diversity and providing habitat for a significant avifaunal diversity. However, these ecosystems are rapidly declining due to degradation caused by excessive human activities. Excessive water abstraction, agricultural practices, drainage agriculture, rapid land-use changes, overgrazing, deforestation, urbanization, and climate change are major causes of wetland loss, with population growth as a significant indirect driver. Biodiversity in these ecosystems is rapidly declining, especially in relation to wildlife and floral diversity.

Rangeland ecosystems: Rangelands in Ethiopia have been shrinking since the 1960s due to extensive land use changes. The expansion of enclosure systems and associated land-use changes has led to increased private ownership of grazing lands. This has curtailed seasonal mobility between wet and dry season

grazing areas, resulting in continuous grazing, loss of vegetation cover, and soil erosion. Climate change and increased human pressure further contribute to the deterioration of the ecosystem, as evidenced by increasing rates of soil erosion, loss of palatable grasses, and rapid expansion of bush encroachment.

Agroecosystem: Ethiopia's agro-ecosystem and agricultural biodiversity, along with their services to human well-being, are significantly affected by natural and anthropogenic drivers of change such as climate change, recurrent droughts, floods, and acidification. These drivers result in disasters that have significant effects on biodiversity for food and agriculture in Ethiopia. The ecosystem is highly vulnerable to climate change and the spread of invasive alien species, negatively impacting crop and livestock production, productivity, and human health.

2.4 Climate

Ethiopia's climate is characterized by a complex and diverse pattern, with highly variable distribution of rainfall and temperature. According to the Köppen climate classification, Ethiopia has several distinct climate regions in its landscape. These include the Hot/Arid or Warm/Desert Climate (Bwh), Hot/Warm Semi-Arid Climate (Bsh), Tropical Savanna Climate (Aw) with a distinct dry winter, Tropical Monsoon Rainy Climate (Am) with a short dry winter, Warm Temperate Rainy or Subtropical Oceanic Highland Climate (Cwb) with a dry winter, Warm Temperate Rainy or Oceanic Climate (Cfb) without a distinct dry season, Humid Subtropical Climate (Cwa), and Temperate Mediterranean Climate (Csb).

The country exhibits strong seasonal variability in precipitation. Ethiopia has three rainfall seasons, locally known as Kiremt, Belg, and Bega. Kiremt is the primary rainy season occurring from mid-June to mid-September, during which most parts of the country receive rainfall. This season accounts for 50-80% of the annual rainfall in Ethiopia. Belg is a short rainy season that takes place from February to May, mainly affecting the southwestern, southern, and eastern parts of the country. The Bega is a dry season occurring from October to January, and rainfall is received in the Somali, southern, and southwestern regions. Mean annual rainfall varies from less than 300 mm in the south-eastern and north-eastern lowlands to over 2000 mm in the southwestern highlands.

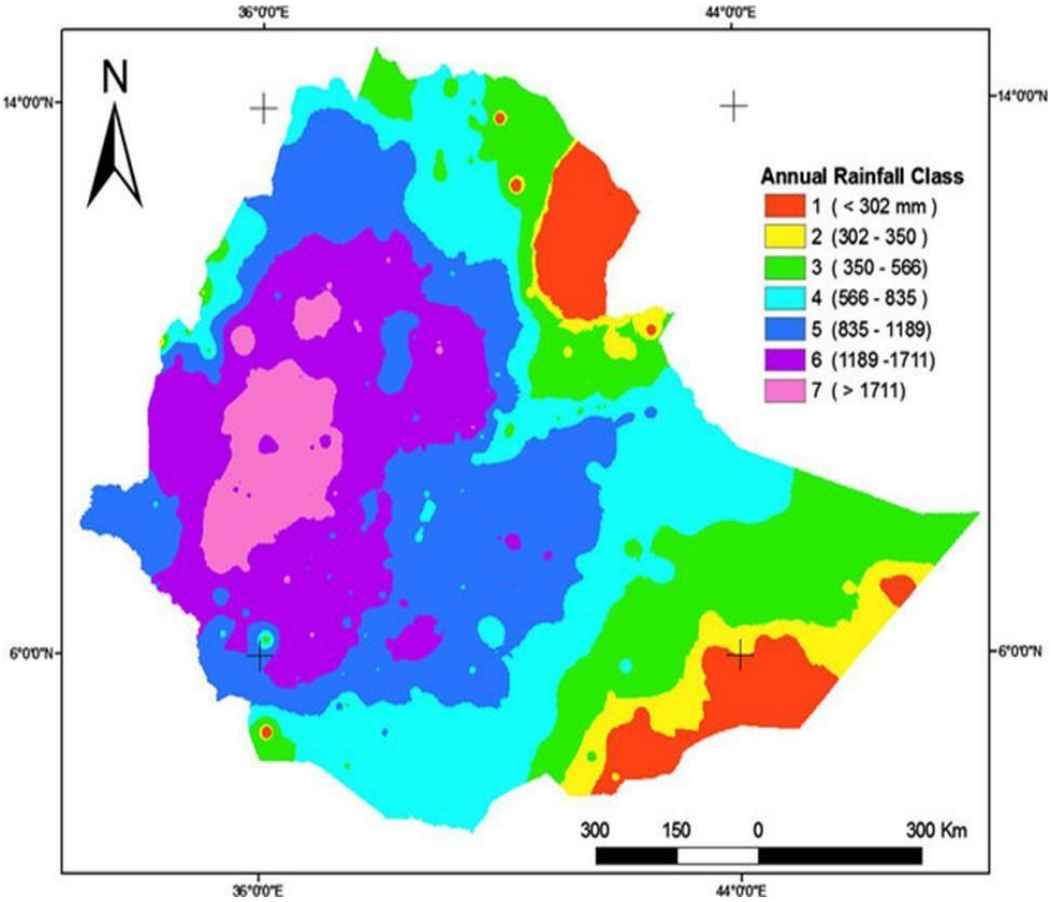
The changing climate has led to occurrence of drought and flash floods in regular intervals which are the two most important challenges the country is facing.

Rainfall and Temperature

The seasonal distribution of rainfall in Ethiopia is influenced by the movement of the Intertropical Convergence Zone (ITCZ), which migrates across the equator. The ITCZ reaches its northernmost position over northern Ethiopia in July and August, and its southernmost position over southern Africa in December to January. As a result, Ethiopia experiences three distinct rainfall seasons: Bega, Belg, and Kiremt.

The main rainy season, Kiremt, occurs from mid-June to mid-September when the ITCZ is in its northernmost position. This season brings the heaviest rainfall and is widespread across the country. Parts of northern and central Ethiopia also have a secondary wet season, Belg, with sporadic and less substantial rainfall from February to May. In the southern regions of Ethiopia, there are two distinct wet seasons corresponding to the passage of the ITCZ. The February to May Belg season is the primary rainy season in the south, with monthly rainfall ranging from 100 to 200 mm. The Bega season, occurring from October to December, has comparatively less rainfall, around 100 mm per month. The easternmost corner of Ethiopia receives minimal rainfall throughout the year.

The movement of the ITCZ is influenced by variations in Indian Ocean sea-surface temperatures, leading to inter-annual variability in the onset and duration of the rainfall seasons. This variability, often associated



with the El Niño Southern Oscillation (ENSO), can result in frequent droughts. During warm phases of ENSO, rainfall in the main wet season is reduced, leading to severe droughts and famines in northern and central Ethiopia. However, it can also bring enhanced rains in the February-April season, primarily affecting southern Ethiopia (

Figure 2-2). Figure 2-3 displays the annual mean temperature.

Figure 2-2: Mean annual rainfall classes of Ethiopia.

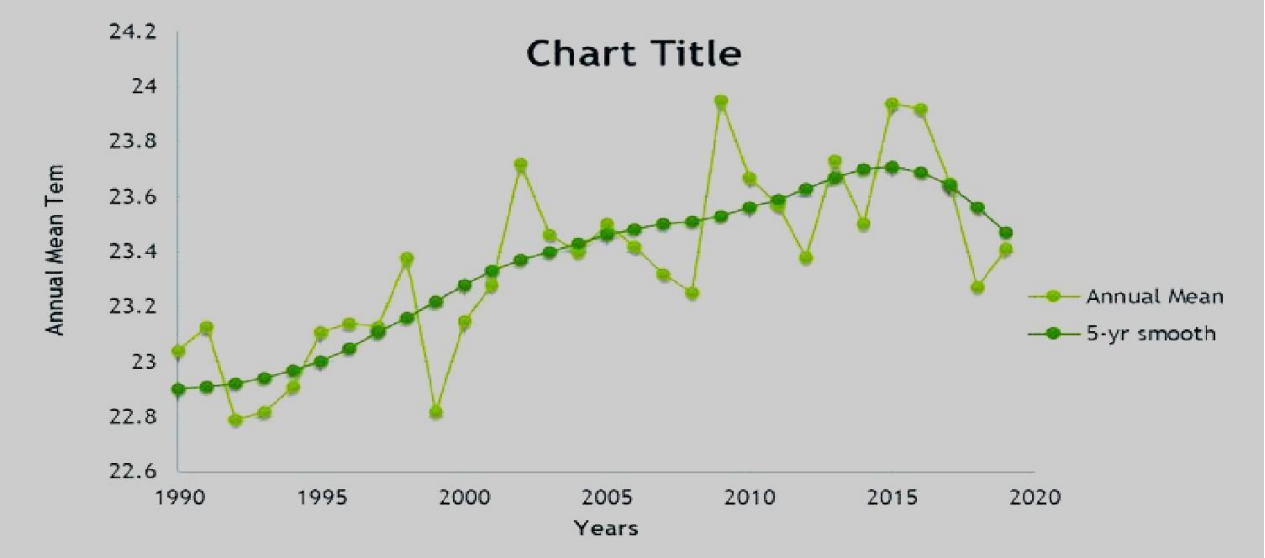


Figure 2-3: Annual mean temperature of Ethiopia

2.5 Population Profile

Ethiopia's population has been increasing at a rapid pace. According to the 1984 Population and Housing Census, the total population was 53.5 million, with 86.3% residing in rural areas and 13.7% in urban areas. By 2007, the total population had risen to 73.9 million, with 11.9 million living in urban areas and 62 million in rural areas. Based on the World Meter elaboration of the latest UN data and CSA projection, Ethiopia's population was approximately 110 million in 2018.

According to the median variant projection by the Central Statistical Agency (CSA) in 2013, the population increased to 94.2 million in 2017, indicating a growth of 20.3 million. It is projected to reach 136 million by 2037 (see Figure 2-4). By the end of 2049, Ethiopia's population is projected to exceed 200 million, and by the end of 2099, it is expected to reach 293.9 million (CSA, 2013).

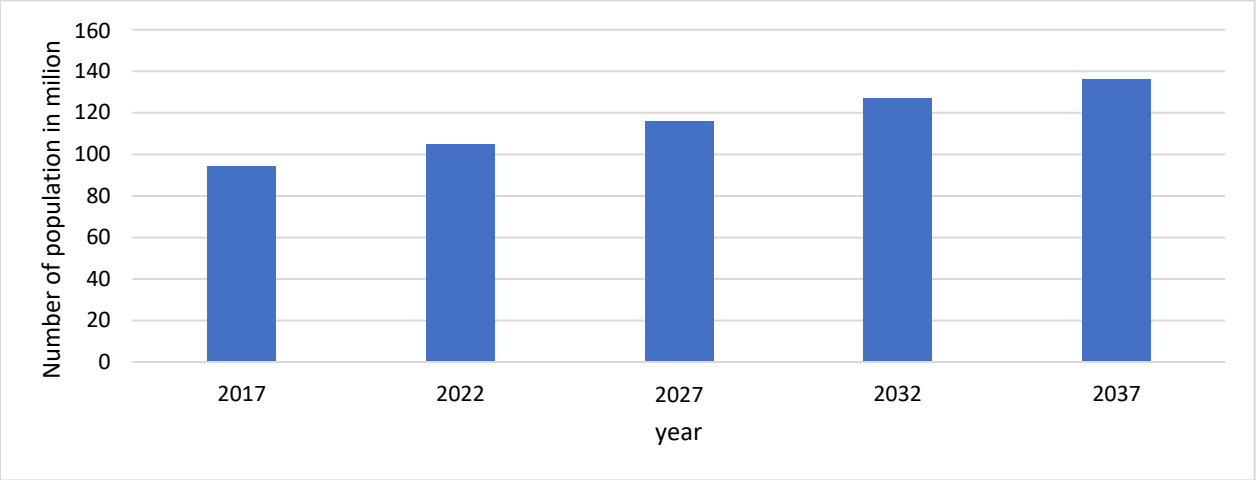


Figure 2-4: Population growth projection of Ethiopia (Source CSS, 2020)

2.6 Economic Profile

Ethiopia has experienced notable economic growth and significant poverty reduction over the past two decades. The average GDP growth rate was 8.7% from 2010 to 2023 . In terms of sectoral contribution, the service sector (40.3%) has consistently accounted for the largest share of GDP, followed by agriculture (32.1%) and industry (28.8%).

Agriculture serves as the primary source of export earnings in the Ethiopian economy. Despite having ample cultivable land, the total cultivated land for crop production is only 12.9 million hectares. Cereal crops occupy 81.5% of this land, pulses account for 12.2%, and oilseeds make up 6.4%. The total grain production reached 335.2 million quintals, with cereals contributing 88.5% and pulses and oilseeds comprising 11.5%.

Ethiopia boasts the largest livestock population in Africa, with 60 million cattle, 31.3 million sheep, 32.7 million goats, 1.4 million camels, and 56.9 million poultry. Livestock rearing in Ethiopia is primarily based on mixed farming or pastoralism, similar to cropping practices.

The industrial development in Ethiopia is relatively limited, with the manufacturing sector being small compared to other African countries. In the mid-2000s, Ethiopia implemented a "green manufacturing" strategy and invested in various light manufacturing sectors, yielding mixed results. While certain sectors such as cut flowers succeeded, challenges were encountered in areas like agribusiness and leather processing. The growth of the manufacturing sector has barely kept pace with Ethiopia's overall economic growth, with its contribution to GDP remaining around 6.5% over the past decade. Additionally, limited

access to finance, unreliable electricity supply, and inadequate land access hinders the business environment for Small and Medium-sized Enterprises (SMEs) and other private firms.

Ethiopia's export structure is characterized by a heavy concentration on a few commodities, such as coffee, oilseeds, pulses, and Khat. Coffee accounts for 29.5% of the country's total visible export earnings. Service exports have been driven largely by the growth of Ethiopian Airlines, the country's flagship airline carrier. The public investment strategy in Ethiopia has led to high demand for capital and construction equipment, resulting in a persistent trade deficit ranging from 16% to 22% over the past decade.

Transportation services play a crucial role in implementing national development plans. Over the last two decades, the road network and density in Ethiopia have expanded. In 2004/05, the road network spanned 37,018 km, and it rapidly increased to 126,773 km by 2017/18. The road density per 1000 persons, which was 0.5 in 2004/05, increased to 1.3 in 2018/19. Similarly, the road density per 1000 square kilometres improved from 33.7 in 2004/05 to 100.4 in 2015/16, and further to 115.2 in 2018/19. Air transport also plays a significant role in Ethiopia's transportation network, ranking second after road transport in carrying passengers and cargo. Ethiopian Airlines, one of Africa's top international carriers, has an extensive network across the continent and adheres to international safety standards.

The Ethiopian government has made substantial investments in the telecom sector, focusing on improving service quality, expanding coverage, and enhancing institutional capacity. This policy measure has boosted the capacity of Ethio-Telecom in terms of customer acquisition, customer satisfaction, and the provision of quality services. Consequently, the total number of mobile subscribers reached 58.08 million in 2016/17, indicating a 70.28% increase over a decade.

The economic structural transformation to accelerate the country's economic growth planned to substantially increase the industries and service sectors contribution for the GDP to 35.9% and 42.1%, respectively. In comparison, the agricultural sector’s contribution will decrease to 22% (**Error! Reference source not found.**) in 2030 (PDC, 2021).

2.7 Energy

The energy sector plays a crucial role in the economic development of a country by providing a reliable energy supply to various sectors. Ethiopia possesses significant renewable energy potential and is actively working towards the development of renewable energy technologies and promoting a green legacy. In terms of hydropower alone, Ethiopia has an untapped potential of up to 45,000 MW, of which only five percent

has been harnessed (Table 2-1). The annual average daily irradiance for solar energy in Ethiopia is estimated to be kWh/m2/day. Additionally, the country has a potential of 10,000 MW from wind energy and 5,000 MW from geothermal energy sources (Tiruye, 2021; Adams, 2018; Mengitu, 2017; and Guangul, 2021).

However, despite having vast reserves of renewable energy sources, only a small fraction of its hydropower potential has been utilized, and other sources remain largely untapped or underdeveloped. The country heavily relies on traditional biomass fuels, such as charcoal, fuel wood, dung cakes, and agricultural waste, which account for approximately 87% of the total primary energy use (Tiruye, 2021).

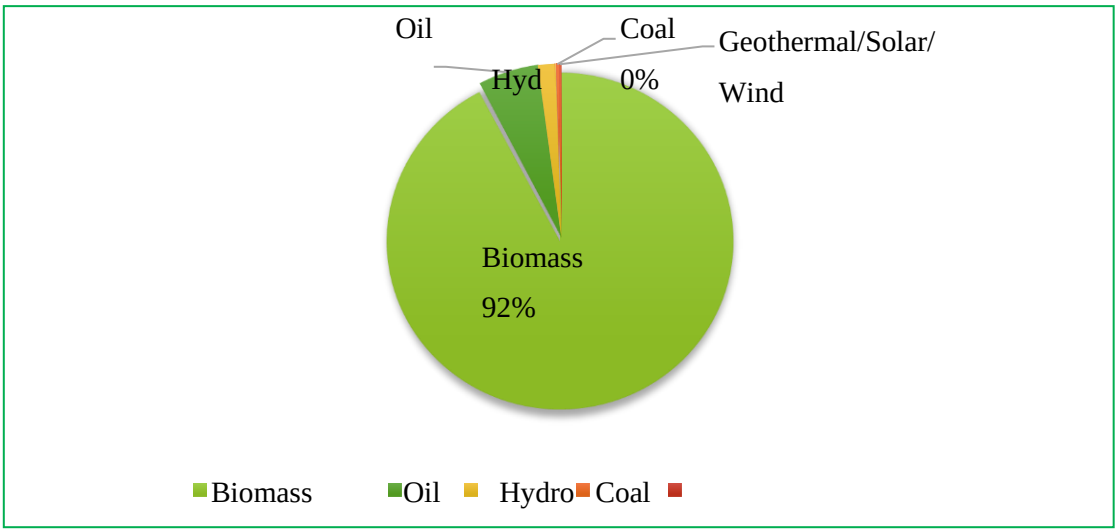
Ethiopia aims to generate foreign exchange by fully utilizing its potential for electricity production, particularly from hydropower plants. The substantial electricity generation from hydropower, including projects like the Ethiopian Renaissance Dam, will also contribute to the economic stability of the region.

Table 2-1: Potential and exploited source of energy in Ethiopia, 2015 Source NC3

S. No	Source	Unit	Potential	Exploited (%)
1	Biomass	Million metric ton/year	75	<50
2	Hydropower	MW	45,000	<10
3	Solar	kWh/m^2/day	5-6	<1
4	Wind	MW	10,000	<1
5	Geothermal	MW	10,000	<1
6	Natural gas	Billion cubic meters	113	0
7	Coal	Million tones	300	0
8	Oil shale	Million tones	253	0
9	Firewood	Million tones	1120	30
10	Agricultural waste	Million tones	15-20	30

Currently the final energy consumption of the country is around 40,000 GWh, of which about 92% are consumed by domestic appliances, 4% by the transport sector and 3% by industry. However, energy thereby is covered by biomass energy which accounts for about 92% of the final energy consumption. While the transport sector is predominantly run by imported petroleum, which accounts for about 4.5% and modern energy contributes only about 6% of the overall energy consumption (Mondal et al., 2017).

Figure 2-5: Potential and exploited source of energy in Ethiopia (source: NC3)



Ethiopia heavily relies on traditional biomass energy sources like fuelwood, charcoal, and dung cakes for household purposes. In 2015, the country's energy supply was primarily dominated by waste and biomass, accounting for 92.2% of the total energy mix, followed by oil (5.7%) and hydropower (1.6%) (World Bank, 2019) (Figure 2-5). Ethiopia's energy consumption per capita is among the lowest in the world. According to the International Energy Agency, the country's total energy consumption is approximately 40,000 GWh, with 92% consumed by domestic appliances, 4% by the transport sector, and 3% by industry. In 2019, Ethiopia's per capita energy consumption was 0.4 tons of oil equivalent (toe), which was below the sub-Saharan Africa average of 0.80 (Nyasha et al., 2018). The per capita electricity consumption was 70 kWh in 2014 and projected to reach about 115 kWh in 2020 (Mondal et al., 2018).

Ethiopia's electricity market structure begins with energy generation by Independent Power Producers (IPP) in Ethiopian Electric Power (EEP). The power is then transmitted by EEP, and the generated electricity is distributed by Ethiopian Electric Utility (EEU). The energy sector plays a vital role in Ethiopia's economic growth and development, and the sector has been undergoing reforms since 2013 to establish a regulated market. Energy trading involves significant global monetary transfers. Ethiopia imports oil from countries

like Saudi Arabia, the Gulf States, and South Sudan, while exporting electricity to neighbouring countries such as Djibouti, Sudan, and Kenya. Historically, Ethiopia has imported an average of about 4 million tons of refined oil annually from the Middle East, but currently relies predominantly on oil imports from South Sudan. The country exports 100 MW of electricity to Sudan, 70 MW to Djibouti, and 10 MW to Kenya. According to the Ethiopian Electric Utility (EEU), the Ethiopian electricity system heavily relies on large-scale hydropower plants and is heavily subsidized, with current electricity tariffs ranging from $0.04 to $0.06 per kWh, making them among the lowest in Africa and globally.

The Government of Ethiopia (GoE) has formulated comprehensive national policies and legislation in the energy sector since 2010, with revisions made in 2013, 2018, and 2019. The enactment of a public-private partnership proclamation occurred in 2018. The government's priorities include expanding electricity access and diversifying the energy mix with clean and renewable sources such as hydro, geothermal, wind, and solar energy to meet the growing demand for electricity and address climate change. The GoE aims to increase electricity access from 45% in 2018 to 100% by 2030 (IEA, 2019).

The Great Ethiopian Renaissance Dam (GERD), which has the potential to generate above 6000 WW is expected to solve Ethiopia’s and the neighbouring country’s energy demand. Tekeze dam, with the potential to generate 300 MW of electricity, was the largest in Africa and Reppie, Africa's first major waste to energy plant, are main examples of mega energy projects in Ethiopia. According to the ten-year development plan (2021-2030), the energy sector is one of the strategic areas to build a climate-resilient green economy by 2030. The plan focuses on addressing inequity in access to electricity services, energy access, and quality, alternative energy sources, electricity infrastructure, energy investment, and income in the energy sector (PDC, 2021).

2.8 Transportation

Transport is an important sector that plays a crucial role in the economic and social integration of a nation on a global scale. Transportation contributes significantly to economic growth and trade. The sector can both enhance and degrade national wealth through the development of transport infrastructure and equipment, foreign exchange expenditures, and its impact on air pollution in Ethiopia (NPC, 2016a). In Ethiopia, motorized transportation systems primarily rely on petroleum fuel, namely oil. Diesel fuel and gasoline are used as energy sources for surface transport (land and rail transport), while kerosene and diesel fuel are typically required for air and sea transport, respectively.

Transportation in Ethiopia is facilitated through various modes, including road, air, rail, and water transport. Currently, road transport is the dominant mode of transport due to the increasing demand for both freight and passenger transportation. Consequently, the vehicle population has experienced substantial growth in recent years. For example, the number of vehicles increased from 244,257 in 2007 to 1,200,110 in 2020 across the country (Federal Transport Authority, 2020). According to projections by the World Bank, the total stock of vehicles is expected to grow by 106% between 2015 and 2025, and by 307% between 2015 and 2035. Road transport accounts for 95% of all passenger transportation and 93% of freight transportation. Road freight transportation is projected to exhibit an annual growth rate of over 13% from 2011 to 2030 (Danyo et al., 2017). Despite quality concerns, road construction has also increased in Ethiopia over the years. For instance, the road network expanded from approximately 100,000 km in 2015 to 121,200 km in 2018 (Ethiopian Roads Authority (ERA), 2021). However, walking remains the primary mode of transportation for most Ethiopian people.

In recent years, numerous transportation projects have been initiated, including mega projects such as the first electrified railway line in East Africa, the Ethiopia-Djibouti railway modernization project, and the construction of the largest airport in Africa near the town of Bishoftu, which aims to accommodate 100 million passengers annually. According to PDC (2021), under the infrastructure development plan, the government aims to expand road transport infrastructure by building 102,000 km of new roads, increase the total length of expressways from 301 km to 1,650 km, upgrade the standard of 28,000 km of existing roads, expand transportation services by increasing the number of dry ports from 8 to 11 and the number of truck terminals from 1 to 23, expand aviation infrastructure by constructing 6 airports and 6 passenger terminals, clearing 10 earth runways, increase the length of railways from 902 km to 4,199 km, improve transport service coverage from 67% to 100% in rural areas and from 34% to 70% in urban areas, and expand the inland water transport system by 2030.

2.9 Industry

The contribution of the industry sector to GDP in Ethiopia has consistently remained below 14%, which is less than half of the average for low-income countries in sub-Saharan Africa (United Nations Industrial Development Organization (UNIDO), 2018). However, the contribution of manufacturing to Ethiopia's economic growth has been increasing in recent years. Historically, most of Ethiopia's exports and per capita growth have been reliant on natural resource extraction or agricultural production. In 2019, the country's major goods exports included coffee (28.7%), cut flowers (14.1%), oilseeds (11.5%), chat (10.9%), pulses (7.9%), gold (6.6%), and leather and leather products (2.4%). Ethiopia experienced a 12% increase in total

export earnings compared to the previous year, marking the first growth in export earnings in five years. On the import side, Ethiopia's main imports consist of foodstuffs, textiles, machinery, and fuel. Since the early 2000s, Ethiopia has actively pursued an industrial policy supported by a range of policy instruments. The focus has been on sectors such as leather and leather goods, apparel and textiles, meat processing, food processing and beverages, cement and steel, and horticulture (Annual report on national bank, 2018-2020).

The establishment of industrial parks in Ethiopia has attracted the attention of foreign companies, leading to an increase in foreign direct investment (FDI) inflows. Table 2-2 provides a detailed list of the Industrial Parks (IP) in Ethiopia. The manufacturing development plan for the next ten years includes targets such as increasing the average capacity utilization of the manufacturing industry from 50% to 85%, raising the domestic market share of locally manufactured industrial products from 30% to 60%, and increasing the number of small and medium-scale manufacturing enterprises from 2,000 to 11,000 by 2030 (PDC, 2021).

Table 2-2: Overview of the Industrial parks in Ethiopia Source: CEPHEUS research team, 2020

Name of industrial zone	Location	Main industry	Owner	Area (ha)	Progress
Eastern industrial zone	Oromia, Dukem	Mixed sector	Private	400	Operational
Bole Lammi industrial park	Addis Ababa	Textile and leather	Government	187	Operational
Hawassa Industrial Park	SNNPR	Textile and Garment	Government	300	Operational
Kombolcha Industrial Park	Amhara	Garment	Government	800	Operational
Adama Industrial Park	Oromia	Textile and Garment, Machinery and Equipment	Government	2,000	Operational
Mekelle Industrial Park	Tigray	Garment	Government	1000	Not operational
Huajian Industrial Park	Lebu, Addis Ababa	Shoes	Private	138	Operational
Mojo George Shoe Industrial Zone	Oromia, Mojo	Leather	Private	86	Operational
Velocity / Vogue	Mekelle	Textile and Garment	Private	177	Not operational

DBL	Mekelle	textile and Garment	Private	79	Not operational
Debre Berhan Industrial Park	Amhara	Textile and Agroprocessing	Government	1,000	Operational
Jimma Industrial Park	Oromia	Garment	Government	150	Operational
Dire Dawa Industrial Park	Dire Dawa	Assembling, Garment, Foods	Government	4,068	Under construction/finalization
Kilinto Industrial Park	Akaki, Addis Ababa	Pharmaceuticals, medical equipment	Government	279	Under construction/finalization
Bahir Dar Industrial Park	Amhara	Garment	Government	1,000	Under construction/finalization
Arerti Industrial Park	Amhara	Construction products, home appliance	Private	100	Under construction/finalization
Yirgalem Integrated Agro-Industrial Park	SNNPR	Agri-product processing	Government	109	Under Operation
Airline and logistic Park	Addis Ababa	Transportation	Government	200	Planning stage
Kingdom Linen Industrial Park	Dire Dawa	Linen	Private	1,000	Planning stage
Bure Integrated Agro-Industrial Park	Amhara	Agri-products processing	Government	155	Under Operation
Bulbula Integrated Agro-Industrial Park	Oromia	Agri-products processing	Government	263	Under Operation
Baeker Integrated Agro-Industrial Park	Tigray	Agri-products processing	Government	151	Not operational

2.10 Waste

The major categories of waste in Ethiopia include municipal solid waste, industrial waste, agricultural waste, and hazardous waste. The physical composition of solid waste in the country is approximately 67% organic, 8% plastic, 6% paper/cardboard glasses, 2% metals, and the remaining 17% consists of other materials, as shown in Figure 2-6 (Teshome, 2021). The estimated average waste generation per capita is

0.32 kg/day, with an annual increase in waste generation of 5%. According to the Addis Ababa City Solid Waste Management Agency, the amount of solid waste generated has increased significantly, ranging from about 3.18 million m^3 in 2016 to 14.66 million m^3 in 2020 (Rubbish, Resources and Residues - Field Report 01, May 2022). This indicates a substantial growth in waste generation. Less than half of the solid waste produced is collected, with 95% of it left unattended in various cities throughout the country.

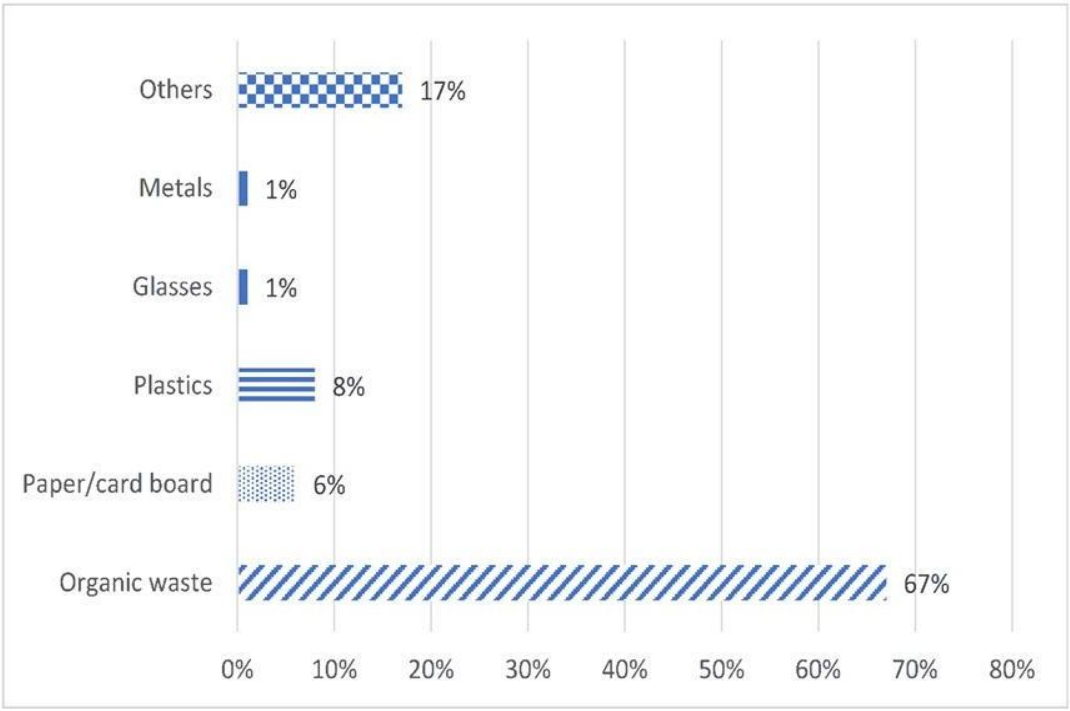


Figure 2-6: Municipal solid waste composition in Ethiopia

Managing solid waste would be very important through the application metrological procedure of monitoring (handling and storage), collecting, transporting, processing, and disposing with the application of 3R (Reduce, Reuse and Recycle). The new waste-to-energy incineration plant (Reppie) is set to transform the site and revolutionize the entire city's approach of dealing with waste. The plant incinerates 1,400 tons of waste every day and 350,000-400 000 tons annually (roughly 80% of the city's rubbish) and supplies 25% of electricity in Addis Ababa.

2.11 Building Stock and Urban Structure

Ethiopia has one of the lowest urbanization rates in Africa, with only 20% of the population residing in cities. However, over the next twenty years, this pattern of urbanization is expected to double. According to projections from the Ethiopian Central Statistics Agency, the urban population will triple to 42.3 million

by 2037, with an annual growth rate of 3.8%. This rapid urbanization will have significant implications for factors such as relative wage rates in rural and urban areas, infrastructure needs, and the delivery of public services.

The Ethiopian government recognizes urbanization as crucial for both economic growth and structural transformation. The National Urban Development Policy, established in 2005, serves as a fundamental policy framework and has led to a shift in focus towards urban centres. This policy document has facilitated coordinated efforts and set the stage for policymakers to prioritize urban and peri-urban areas. Building upon this policy, various urban development strategies have been implemented. Currently, the urban development policy in Ethiopia operates through the framework of the Ethiopian Cities Prosperity Initiative (ECPI). The ECPI aims to support the development of Ethiopia's cities, urban areas, and rural sectors, ensuring that they are "Green, Resilient, and Well-Governed" in line with Sustainable Development Goal (SDG) 11, which aims to make cities and human settlements inclusive, safe, resilient, and sustainable. The objectives of the ECPI encompass making cities economically productive, socially inclusive, and environmentally sustainable by decentralizing urban infrastructure, services, and systems (Swiss Agency for Development and Cooperation (SADC), 2017).

2.12 Agriculture

Agriculture is a sector with significant growth prospects in Ethiopia. The principal crops grown in the country include cereals such as teff, wheat, barley (cultivated in highland areas), and maize, sorghum, millet (grown in lowland areas). Pulses such as faba bean, field pea, chickpea, lentil, grass pea, and lupine are primarily cultivated in the highlands, while haricot bean, cowpea, pigeon pea, and mung beans are grown in warmer lowland areas. Oilseeds like sesame, soybean, and niger seed are mainly cultivated in the warmer lowlands. Root and tuber crops such as enset, taro, yams, cassava, and potatoes are staple diets in the southern and southwestern parts of the country. Vegetable crops like Ethiopian kale, cabbage, beetroot, carrot, tomato, shallot, onion, and garlic are grown across the country. Fruit crops, including banana, avocado, and mango, are predominantly cultivated in the SNNP, Oromia, Amhara, and Benishangul-Gumuz regions. Coffee is primarily grown in areas such as Sidamo, Guji, Harar, Genika, Limu, and Yirgachefe (CSA, 2020). The main agricultural exports of Ethiopia are coffee, oilseeds, and pulses, which account for more than 50% of the country's total export values.

Effective agricultural management practices play a vital role in improving productivity and production. The government of Ethiopia has placed emphasis on developing the agriculture sector and ensuring food

security. Key priorities identified include the development of small and large-scale irrigation, financing agricultural inputs, increasing crop and livestock productivity, promoting mechanization in farming, reducing post-harvest losses, establishing a research-based food security system, and enhancing natural resource management. The government aims to utilize vast untapped arable land, modernize production systems, and promote technology adoption to achieve agricultural development. Additionally, efforts are being made to combat land degradation, reduce pollution, decrease greenhouse gas emissions, and enhance forest protection and development (PDC, 2021).

2.13 Forest

Ethiopia is rich in forests in the Horn of Africa. According to a study conducted by the World Bank, the land covered by forests in Ethiopia is about 17 million hectares, which accounts for 15.61% of the country's total land area (World Bank, 2020). Ethiopia has adopted a new forest definition that includes both forests and shrublands. It defines forests as "land spanning at least 0.5 ha covered by trees and bamboo, attaining a height of at least 2 m and a canopy cover of at least 20%, or trees with the potential to reach these thresholds in situ in due course." On the other hand, shrublands are defined as "land with shrubs/bushes canopy cover < 10% or combined cover of bush and shrubs < 10%. Shrubs and bushes are woody perennial plants, 2 m in height at maturity in situ" (FAO, 2020). The reason for Ethiopia's change in the national forest definition is to better capture the dry and lowland-moist vegetation resources (FDRE, 2016).

Recently, Ethiopia's National Forest Inventory, conducted from 2013 to 2017, categorized forests into five biomes: Acacia-Commiphora woodland, Combretum-Terminalia woodland, Dry Afromontane, Moist Afromontane forests, and others (Ministry of Environment, Forest and Climate Change (MEFCC), 2018). Managing forest resources provides multiple benefits as forests are a source of essential ecosystem services, including carbon sequestration, crop pollination, conservation of agricultural soils, and water regulation in streams and rivers. Additionally, forested land is crucial for approximately two-thirds of the country's drinking water.

Forests in Ethiopia contribute to economic growth and serve various purposes, including the production of wood products for construction, furniture, electrification, and the pulp and paper industry. Moreover, non-timber forest products such as bamboo, honey, forest coffee, fodder, gum and resin, beeswax, and traditional medicinal herbs are important sources of livelihood for local forest-dependent communities. Coffee alone contributes 5% of GDP and 30% of export earnings, while honey generates an annual income of over $60,000, and bamboo contributes $2 million in revenue (EFCCC, 2020). The country exports various wood

products in small quantities, including poles, veneer, swan wood (high volume and value), furniture, fuelwood/charcoal, and chip wood (Forest Sector Review, 2015). Among these, sawn wood is the highest-volume and highest-value product in terms of exports. The production of wood products, excluding furniture, has shown steady growth, ranging from ETB 62.8 million in 2005 to ETB 163.8 million in 2009, with an average annual growth rate of 27.1%. Out of this, approximately ETB 19.3 million worth of products were exported, while the remaining balance, supplemented with imports, was consumed in the local market. With population growth and economic development projections, the total demand for wood products in Ethiopia is expected to increase by about 27% over the next 20 years, reaching an annual consumption of 158 million m^3 by 2033. To meet the needs of Ethiopia's growing economy, there is a need to close a supply gap of 4.4 million m^3 of industrial roundwood over the next 20 years and increase forest cover to 30% by 2030 (EFCCC, 2019).

2.14 Development Priorities and Objectives

According to the FDRE Ministry of Planning and Development, the focus areas of development in Ethiopia are categorized into three groups: (i) productive sectors (including agriculture, manufacturing, and mining), (ii) service sector (the tourism industry), and (iii) enabling sectors (including energy, transport, sustainable finance, innovation and technology, urban development, irrigation, and human capital development) (PDC, 2021). The new ten-year development plan, which runs from 2021 to 2030, emphasizes a multi-sectoral growth approach to diversify economic growth and create jobs, with necessary policy reforms across different sectors. Attention is given to agriculture, manufacturing, mining, tourism, and the ICT sector as sources of growth.

The key strategic pillars of the ten-year development plan are Quality Economic Growth and Shared Prosperity, Economic Productivity and Competitiveness, Technological Capability and Digital Economy, Sustainable Development Financing, Private Sector-led Economic Growth, Resilient Green Economy, Institutional Transformation, Gender and Social Inclusion, Access to Justice and Efficient Civil Services, and Regional Peace Building and Economic Integration (PDC, 2021). To achieve these long-term national plans and make Ethiopia an "African beacon of prosperity," the following major development objectives have been identified:

1. Building a prosperous country by creating a pragmatic market-based economic system and enhancing the role and participation of the private sector.

2. Maintaining macroeconomic stability, ensuring rapid and sustainable economic growth, and creating decent jobs.
3. Ensuring structural economic transformation by promoting overall productivity and competitiveness.
4. Creating an enabling environment where every citizen can become owners and beneficiaries of development by ensuring quality and accessible basic social services and infrastructure provision.
5. Establishing a competent, independent, and quality civil service system to build government capacity and establish good governance.
6. Building strong and inclusive institutions to ensure a peaceful society, access to justice, and upholding the rule of law and human rights.

Ethiopia successfully implemented the Millennium Development Goals (MDGs), integrating them into its national development framework and achieving remarkable progress from 2000 to 2015. Six of the eight MDGs were successfully achieved (NPC, 2017). The implementation of the MDGs involved effective government leadership and coordination among all stakeholders in an organized and structured manner. Valuable lessons were learned at the national level, enabling Ethiopia to make significant contributions to the preparation of the 2030 Global Agenda for Sustainable Development Goals (SDGs). Ethiopia further undergone Voluntary National Review in 2022 and has made substantial progress, having an index score SDG with nearly similar to a sub-regional average.

In the ten-year plan, the government highlights several challenges, including the lack of synchronization of investment with resource potentials and development needs, poor alignment of federal, regional, and district-level investment plans with national development goals and settlement patterns, inadequate regional coordination due to limited consideration of trans-regional and spatial issues in regional development plans, and inter-regional and intra-regional disparities in infrastructure development and access to services (PDC, 2021).

2.15 Priorities Related to Mitigation of Climate Change

Climate change (CC) is a fundamental development issue for Ethiopia. According to the Climate Resilient Green Economy (CRGE) which was launched in 2011 and assessed for its implmenetation progress in 2019, agriculture, forestry, industry, water and energy, urban development, industry and transport are key priority areas in climate mitigation interventions (CRGE, 2011). Climate change affects nearly all natural and

economic systems. Mitigation strategies include promoting sustainable and intensified agriculture, retrofitting buildings for energy efficiency, adopting renewable energy sources such as solar, wind, and small hydro, promoting sustainable transport systems like bus rapid transit, electric vehicles, and biofuels, and encouraging sustainable land use and forest management. For climate change mitigation to be sustainable and widely implemented, it needs to be integrated or "mainstreamed" into government policies. Accordingly, efforts have made to mainstream climate change into the country's developmental strategies while it is being considered as one of the key pillars of the new ten-year development plan.

In the ten-year development plan, the government places particular emphasis on a climate-resilient green economy, with the following priorities (PDC, 2021): (i) increasing efforts for basin development to combat land degradation and reduce pollution, (ii) improving productivity and reducing greenhouse gas (GHG) emissions, (iii) increasing forest protection and development, (iv) expanding the production of electricity from renewable sources for domestic use and export, and (v) focusing on modern and energy-saving

technologies. The overall governance structure for CRGE has been established at the federal, regional, and local levels, as shown in Figure 2-7 below.

Ethiopia is a signatory to various international environmental conventions and protocols and is undertaking different activities to fulfil its commitments in creating a resilient climate and sustainable development, as clearly articulated in its plans and strategy documents.

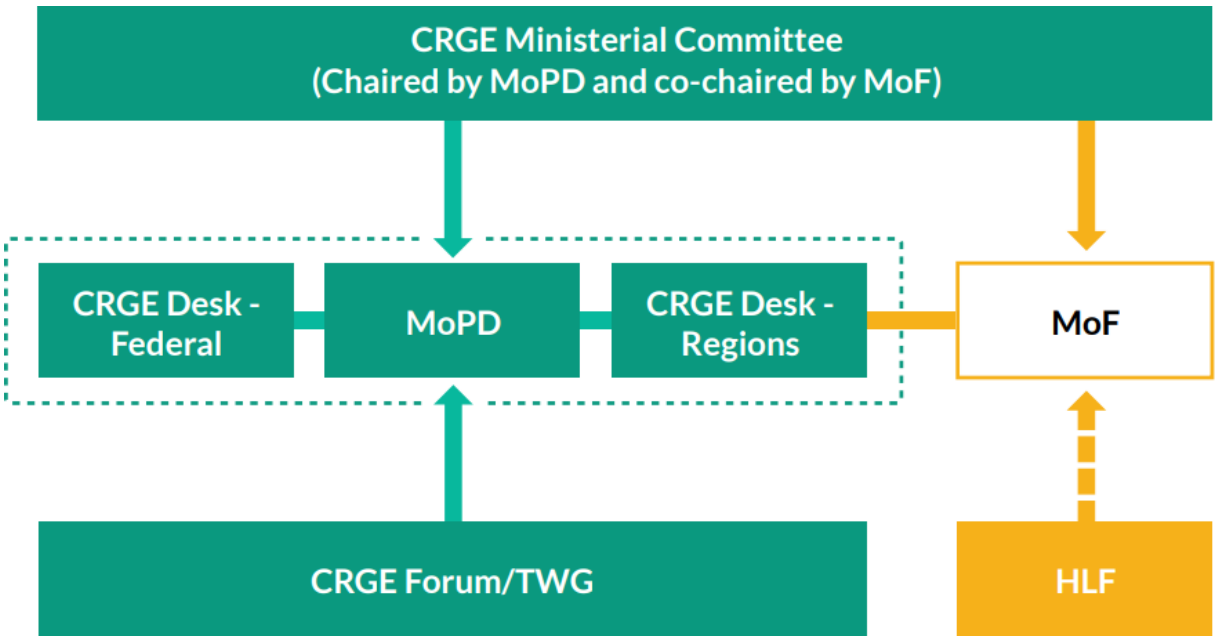


Figure 2-7: Ethiopia CRGE governance

The regional states in Ethiopia have the authority to issue regulations, while regional bureaus, agencies, zonal departments, and woreda (i.e. lower level administration) offices are responsible for implementing the climate policies. In response to the observed impacts of climate change, the national government has been working to address them through policy instruments based on national-level assessments. Local administrations play a crucial role in climate change adaptation and mitigation by initiating, influencing, and mediating external interventions related to coping, adapting, and mitigating climate impacts. They also play a role in shaping the actions and capabilities of households and communities to respond to climate impacts and adopt adaptation practices as well as mitigation actions. Generally, the development of policies and strategies related to climate change in Ethiopia well advanced and is not be considered as a problem.

3 DOMESTIC MEASUREMENT, REPORTING AND VERIFICATION SYSTEM

3.1 Introduction

The Federal Democratic Republic of Ethiopia (FDRE) ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 31 May 1994 and the Kyoto Protocol on 21 February 2005 as a non-Annex I party, demonstrating its commitment to join the international community in combating climate change. As a non-Annex I Party, Ethiopia is required under Article 4, paragraph 1 (a) and Article 12, paragraph 1 (a) of the Convention to communicate a national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases (GHGs) not controlled by the Montreal Protocol to the Conference of the Parties (COP), to the extent of its capacities, following the guidelines in the annex to decision 17/CP.8.

The Paris Agreement (COP 21, 2015) commits both developed and developing countries to undertake and communicate their efforts to limit the increase in global average temperature to well below 2°C above pre-industrial levels, with a goal to pursue efforts to limit the increase to 1.5°C above pre-industrial levels. Furthermore, Article 4, paragraph 6 of the Paris Agreement (2015) acknowledges that least developed countries like Ethiopia may prepare and communicate strategies, plans, and actions for low greenhouse gas emissions development that reflect their special circumstances.

The Paris Agreement also establishes an enhanced transparency framework for climate action and support to ensure a clear understanding of mitigation actions, track progress towards Nationally Determined Contributions (NDCs), and facilitate a global stock take to be conducted every five years. The more regular,binding, and comprehensive reporting requirements under the Paris Agreement are essential tools for developing countries to improve their national GHG inventories and develop ambitious strategies coveringboth mitigation and adaptation efforts.

3.2 Efforts to Build a National MRV System

Ethiopia is developing different policies, strategies and robust MRV systems to transform the MRV system to Enhance Transparency Framework following the adoption of the Paris Agreement. To enhance report preparation process, continuous capacity building training which includes database management system were given for the federal, regional and Woreda experts.

3.2.1 National Measuring, Reporting and Verification (MRV) Framework

Ethiopia's aim of following a green economic path, would need robust, accurate, and reliable data for green growth scenario planning and their evaluation. This would require development of an institutional structure, and a system which will facilitate the data collection, reporting, review, and aggregation from across the country. In 2016, the EPA with the support from the Global Green Growth Institute (GGGI) established an MRV framework for a sustainable system.

The framework will help in:

- Developing an institutional structure with clearly identified data custodians at various sources, woredas, regions, and the federal ministries along with their roles and responsibilities;
- Developing a data management system (*i.e.*, national inventory system) which will ensure data flow from various sources, woredas, regions, and the federal ministries to the EPA for final consolidation at a predefined interval;
- Providing necessary guidance to all users involved in the GHG emission inventory process on good practices thereby standardizing the GHG emission inventory process and eliminating human bias, and
- Conducting consultations with relevant stakeholders for setting up an agreed procedure for exchange of data and engagement with the EPA and other relevant stakeholders such as the federal ministries, Central Statistical Agency (CSA) etc.;

3.2.2 Coordination Entities

The Ministry of Planning and Development is the designated institution and national focal point of UNFCCC for coordinating the country's reporting to the UNFCCC, including the National Communications, National GHG Inventory and Biennial Update Reports. The Ministry, therefore, supports, oversees and coordinates the collection, analysis and archiving of information and activity data for the GHG emission and removal estimates in collaboration with Ethiopian Environmental Protection Authority. The Director, Greenhouse Gas Emission Reduction Measuring, Reporting and Verification Directorate (National MRV Directorate), in EPA, is the national coordinator for the GHG inventory development process and provides the necessary administrative and logistical support to ensure an efficient and sustainable GHG Inventory Management System. The institutional arrangements for the MRV system are

based on the provision of the CRGE strategy with established linkages to sub-national and sectoral institutions.

3.3 GHG Inventory System

The National GHG Inventory for FBUR development is based on the IPCC 2006 guideline for all source categories that the Ministry of Planning and Development and EPA are responsible for coordinating related issues, preparing an agreement to be signed as a Memorandum of Understanding (MoU) and following line ministries to report annually their sector GHG emission by source and removal by sink. The annual GHG inventory report compilation helps to track GHG emission level and ensure the continuous on time reporting system as well as the archive Activity Data (AD) of Emission Factor (EF) and action taken annually to ease the compilation and preparation report required. Based on the MoU, the sector specific GHG emission report is provided by the line ministries and Ethiopian Statistical Service to compile Ethiopia's National Greenhouse Gas Inventory report. As EPA is Ethiopia's Coordinating Entity for climate MRV through its MRV Directorate, the MRV Directorate reports GHG inventory data, and undertakes official MRV by working in collaboration with a federal ministries and agencies. Consequently, the national teams of the directorate oversee all activities of the system for MRV of emissions through the four major sectors described under the Institutional Arrangements for compilation of inventories. The Ethiopian Statistical Service is the institution that work with the national team and on all the data throughout the country, including agriculture (e.g., crop production, livestock population, etc.) and industry (e.g., industrial statistics) at a national level.

3.3.1 Policy Issues and Institutional Arrangements

The CRGE Strategy have identified climate change mitigation initiatives across the main economic sectors that contribute to the realization of building a carbon neutral and climate resilient as well as the Ethiopia NDC goals. The country develop roadmap attempts to highlight the climate smart initiatives identified by the CRGE sectors and estimate the GHG emission reduction targets for all sectors on annual bases between 2018 and 2030. The road map also presents the resource requirement, activity plan, logical framework and roles and responsibilities of stakeholders at various levels.

The EPA also ensures quality checks of the GHG inventory report meets all international requirements using the data management system established as a national. The responsibility of other government departments and institutions is to provide data and validate the data and information generated. The

institutional arrangement currently exists for GHG Inventory and Mitigation reporting mechanism for national & international organization consumption is indicated in Figure 3-1 below.

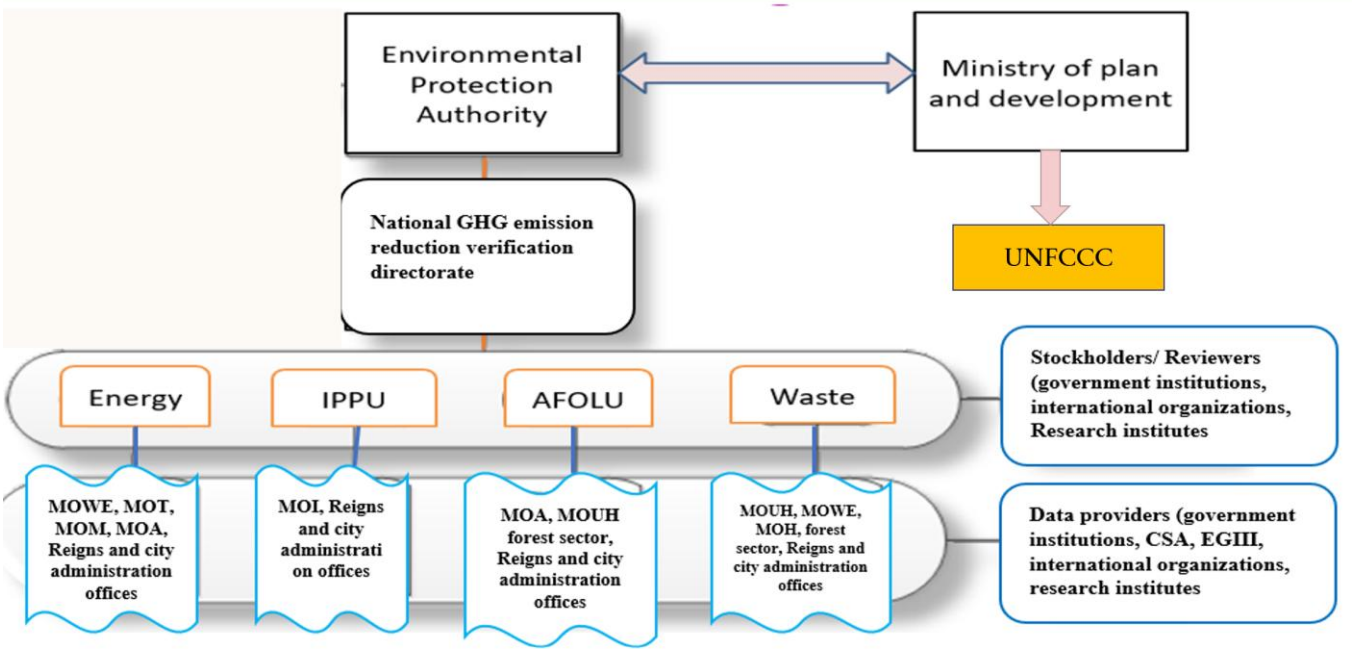


Figure 3-1: Institutional arrangements for the preparation of GHG inventory

4 NATIONAL GREENHOUSE GAS INVENTORY

4.1 Overview of the Inventory

This chapter describes the national greenhouse gas (GHG) inventory for the year 2018 to 2020. Estimations of anthropogenic emissions and removals were conducted for four sectors, namely the Energy, Industrial Processes and Product Used (IPPU), Agriculture, Forestry and Other Land Use (AFOLU) and Waste sectors. The description of the AFOLU sector would be divided into two as IPCC Category 3A and 3C and Agriculture and FOLU (IPCC Category 3B). The inventory also contains time series estimates for the years 2018 to 2020 for each of these sectors. This chapter also includes information on the methodology used, data sources, emission factors, gasses covered, and assumptions used for each of the sectors. Additionally, key category analysis by level and trend as well as uncertainty assessment are also provided.

The level of accuracy of the estimates is largely influenced by the availability of reliable data and use of appropriate coefficients. Keeping the IPCC 2006 guidelines, the gasses covered in this inventory include the major direct gasses. Carbon dioxide, (CO_2), Methane (CH_4) and Nitrous oxide (N_2O). The preparation of the First Biennial Update Report was highly consultative with validation workshops bringing on board several stakeholders and experts including representatives of the private sector, academia and civil society.

4.2 Scope, Methodologies and Data Sources

The 2006 IPCC Guidelines for National Greenhouse Gas Inventories, along with the 2019 refined guideline Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories time series, were recalculated to incorporate updated methodologies, activity data, and emission factors as per the guidelines. The GHG inventory estimates were generated using the IPCC Inventory Software. Additionally, external spreadsheets, as outlined in the 2006 IPCC Guidelines, were created to verify the calculations from the software.

4.2.1 Methodology and Parameters

The 2006 IPCC Guidelines for National Greenhouse Gas Inventories and 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands were used to estimate the GHG emissions and removals. Time series were recalculated to reflect the updated methodologies, activity data and emission factors were seen in accordance with the guidelines. The IPCC Inventory software was used to generate the GHG inventory estimates. External spreadsheets as provided in the 2006 IPCC Guidelines

were also created for checking the calculations from the software. For the energy sector, estimates were calculated for both reference and sectoral approaches.

Geographic coverage: - The geographic coverage of the GHG inventory is complete. It covered the entire territorial boundary of Ethiopia. Gasses Estimation for the three major direct and indirect gasses consisting of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) was carried under this inventory for the whole time series. Calculations were also conducted for the hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), Sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3) gasses for the IPPU sector. The Global Warming Potential (GWP) values from the IPCC Fourth Assessment Report (AR4) were used in the CO_2 equivalent calculations, and these are as shown in Table 4-1: Global Warming Potential Used Table 4-1 below.

Table 4-1: Global Warming Potential Used

Gas	Chemical Formula	GWP
Methane	CH_4	25
Nitrous oxide	N_2O	298
Hydrofluorocarbons	HFCs	1,430 – 14,800
Perfluorocarbons	PFCs	7,390 – 12,200
Sulphur hexafluoride	SF_6	22,800
Nitrogen trifluoride	NF_3	17,200

Description of Data Sources and Assumptions

International data were utilized in cases where national level data were unavailable. A consistency check was conducted between Ethiopia's activity data reported at the national level and international databases. The majority of the activity data used for calculating the GHG inventory were obtained from annual national publications. In cases where additional activity data were needed, departmental publications or specific sectoral reports were consulted. Official requests were made by the Environmental Protection Authority (EPA) to other government agencies and private sectors to obtain supplementary activity data. For the energy sector, the International Energy Agency (IEA) served as the primary source of data, with additional information obtained from other energy authorities. Official annual industry publications were used to gather data for the IPPU sector. Overall, data collected from different sectors were compared with the national statistics services and used following the IPCC 2006 guidelines for all sectors.

Archiving and Documentation

For each year of GHG inventory calculation, each of the sector's compilers generate a set of activity data, based of IPCC guideline. For the archiving of the GHG Inventory, the IPCC Inventory Software database, and a flat file system for the external 2006 IPCC Guidelines spreadsheets were used for each of the five sectors (Energy, IPPU, Agriculture, LULUCF and Waste).

Key Category Analysis

According to the Good Practice Guidance 2000, key categories are those that contribute to 95 % of the total annual emissions as ranked from the largest to the smallest emitter. Alternatively, a key source is one that is prioritized within the national inventory system because of the considerable influence it has on a country's total inventory of direct GHGs in terms of the absolute level of emissions, the trend in emissions, or both (IPCC, 2000). Enteric Fermentation, Cropland Remaining Cropland, Direct N_2O Emissions from managed soils, Manure Management and Indirect N_2O Emissions from managed soils are the five major sources ranked from the largest to the smallest sources of emissions (Table 4-2).

Table 4-2: Identified key category using the level assessment

IPCC Category code	IPCC Category	Greenhouse gas	2020 Ex,t (Gg CO_2 Eq)	|Ex,t| (Gg CO_2 Eq)	Lx,t	Cumulative Total of Column F
3.B.1.a	Forest land Remaining Forest land	CO_2	-100689.809	100689.809	0.233660581	0.233660581
3.B.3.b	Land Converted to Grassland	CO_2	92127.47615	92127.47615	0.213790848	0.447451429
3.A.1	Enteric Fermentation	CH_4	69269.17147	69269.17147	0.160745909	0.608197338
3.B.2.a	Cropland Remaining Cropland	CO_2	55151.93443	55151.93443	0.127985475	0.736182813
3.B.2.b	Land Converted to Cropland	CO_2	32831.70763	32831.70763	0.076189199	0.812372012
3.B.1.b	Land Converted to Forest land	CO_2	-23354.37609	23354.37609	0.054196121	0.866568133
3.C.1	Emissions from biomass burning	CH_4	11182.64358	11182.64358	0.025950422	0.892518554
1.A.4	Other Sectors - Biomass	CH_4	10614.2575	10614.2575	0.024631426	0.917149978
1.A.3.b	Road Transportation	CO_2	6300.277068	6300.277068	0.014620411	0.931770391
2.A.1	Cement production	CO_2	4286.066265	4286.066265	0.009946237	0.941716629

4.D	Wastewater Treatment and Discharge	CH_4	3690.649542	3690.649542	0.008564514	0.950281143
3.B.6.b	Land Converted to Other land	CO_2	-3045.083975	3045.083975	0.007066416	0.957347559
1.A.2	Manufacturing Industries and Construction - Liquid Fuels	CO_2	3021.65325	3021.65325	0.007012043	0.964359602
3.A.2	Manure Management	N_2O	2811.470525	2811.470525	0.006524293	0.970883895
3.A.2	Manure Management	CH_4	2227.482069	2227.482069	0.005169091	0.976052986
1.A.1	Energy Industries - Liquid Fuels	CO_2	1825.8981	1825.8981	0.004237176	0.980290162
1.A.4	Other Sectors - Biomass	N_2O	1681.075812	1681.075812	0.003901101	0.984191263
4.D	Wastewater Treatment and Discharge	N_2O	1412.515225	1412.515225	0.00327788	0.987469143
1.A.4	Other Sectors - Liquid Fuels	CO_2	1231.61091	1231.61091	0.002858074	0.990327217
1.A.2	Manufacturing Industries and Construction - Solid Fuels	CO_2	871.32276	871.32276	0.00202199	0.992349207
3.B.4.b	Land Converted to Wetlands	CO_2	718.7443516	718.7443516	0.001667917	0.994017124
3.C.4	Direct N_2O Emissions from managed soils	N_2O	616.2915881	616.2915881	0.001430165	0.995447289
3.C.6	Indirect N_2O Emissions from manure management	N_2O	465.0027375	465.0027375	0.001079084	0.996526374
4.A	Solid Waste Disposal	CH_4	423.0927585	423.0927585	0.000981828	0.997508202
3.C.3	Urea application	CO_2	374.1906667	374.1906667	0.000868346	0.998376548
3.C.5	Indirect N_2O Emissions from managed soils	N_2O	204.8663431	204.8663431	0.000475412	0.99885196
1.A.3.a	Civil Aviation	CO_2	136.7795	136.7795	0.00031741	0.999169371
1.A.3.b	Road Transportation	N_2O	97.93855288	97.93855288	0.000227276	0.999396647
4.C	Incineration and Open Burning of Waste	CH_4	96.01516625	96.01516625	0.000222813	0.999619459
3.B.5.b	Land Converted to Settlements	CO_2	-45.09333693	45.09333693	0.000104644	0.999724103

The Key GHG emission sources using trends include Cropland Remaining Cropland, Enteric Fermentation, and Direct N_2O Emissions from managed soils. Land Converted to Cropland and Indirect N_2O emissions from managed soils become more significant sources than the Manufacturing Industries. Considering the

fully disaggregated results of both types of assessment, the number of key categories is not regressed when changing from level to trend assessment. The trend assessment is a good indicator of categories gaining importance over time following development trends as opposed to the level assessment that considers absolute emissions of one year only.

Table 4-3: Identified key category using the approach 1 trend assessment

IPCC Category code	IPCC Category	Greenhouse gas	2020 Year Estimate Ext ($Gg\ CO_2\ Eq$)	Trend Assessment (Txt)	% Contribution to Trend	Cumulative Total of Column G
4.A	Solid Waste Disposal	CH_4	423.0927585	2767.98219	0.305906498	0.305906498
3.B.1.a	Forest land Remaining Forest land	CO_2	-100689.809	1391.024189	0.153730519	0.459637017
3.B.3.b	Land Converted to Grassland	CO_2	92127.47615	1272.736031	0.140657777	0.600294794
3.A.1	Enteric Fermentation	CH_4	69269.17147	956.9498052	0.105758326	0.70605312
3.B.2.a	Cropland Remaining Cropland	CO_2	55151.93443	761.9209497	0.084204505	0.790257625
3.B.2.b	Land Converted to Cropland	CO_2	32831.70763	453.5682406	0.050126577	0.840384202
3.D.1	Harvested Wood Products	CO_2	0	333.1381541	0.036817118	0.877201319
3.B.1.b	Land Converted to Forest land	CO_2	-23354.37609	322.6394249	0.035656839	0.912858159
3.C.1	Emissions from biomass burning	CH_4	11182.64358	154.4876078	0.017073362	0.929931521
1.A.4	Other Sectors - Biomass	CH_4	10614.2575	146.6353853	0.016205566	0.946137087
1.A.3.b	Road Transportation	CO_2	6300.277068	87.0379822	0.009619095	0.955756182
2.A.1	Cement production	CO_2	4286.066265	59.21177041	0.006543852	0.962300034
4.D	Wastewater. Treatment and Discharge	CH_4	3690.649542	50.98612104	0.005634785	0.96793482

3.B.6.b	Land Converted to Other land	CO_2	-3045.083975	42.06766813	0.004649153	0.972583973
1.A.2	Manufacturing Industries and Construction - Liquid Fuels	CO_2	3021.65325	41.74397395	0.00461338	0.977197352
3.A.2	Manure Management	N_2O	2811.470525	38.84031112	0.004292478	0.981489831
3.A.2	Manure Management	CH_4	2227.482069	30.77254263	0.00340086	0.984890691
1.A.1	Energy Industries - Liquid Fuels	CO_2	1825.8981	25.22468212	0.002787733	0.987678424
1.A.4	Other Sectors - Biomass	N_2O	1681.075812	23.22397016	0.002566622	0.990245045
4.D	Wastewater Treatment and Discharge	N_2O	1412.515225	19.51382038	0.002156591	0.992401636
1.A.4	Other Sectors - Liquid Fuels	CO_2	1231.61091	17.01463718	0.001880391	0.994282027
1.A.2	Manufacturing Industries and Construction - Solid Fuels	CO_2	871.32276	12.03727615	0.001330312	0.995612339
3.B.4.b	Land Converted to Wetlands	CO_2	718.7443516	9.929413803	0.00109736	0.996709699
3.C.4	Direct N_2O Emissions from managed soils	N_2O	616.2915881	8.514034493	0.000940938	0.997650636
3.C.6	Indirect N_2O Emissions from manure management	N_2O	465.0027375	6.423987319	0.000709954	0.99836059
3.C.3	Urea application	CO_2	374.1906667	5.16942354	0.000571304	0.998931895
3.C.5	Indirect N_2O Emissions from managed soils	N_2O	204.8663431	2.830217296	0.000312784	0.999244679
1.A.3.a	Civil Aviation	CO_2	136.7795	1.889601292	0.000208831	0.99945351
1.A.3.b	Road Transportation	N_2O	97.93855288	1.353015737	0.00014953	0.99960304
4.C	Incineration and Open	CH_4	96.01516625	1.326444257	0.000146593	0.999749634

	Burning of Waste					

4.3 Quality Assurance and Quality Control (QA/QC)

Quality assurance/quality control (QA/QC) procedures were developed and implemented in accordance with the IPCC 2006 Guidelines for National GHG Inventories. The inventory compilers were responsible for carrying out the QA/QC activities, while the sector coordinators were tasked with ensuring that adequate QA/QC procedures were followed for the inventory, its supporting documents, calculation spreadsheets, and the use of the IPCC GHG inventory software. The quality control process was conducted at three stages of the inventory process as outlined below:

a) Pre-inventory preparation quality control: This stage involved the compilation and cleaning of activity data by sector teams before the inventory compilation phase.

b) Quality control during inventory preparation: During this phase, activity data and emissions factors were checked and verified to ensure accurate input of figures into the software.

c) Post-inventory preparation quality control: This stage involved the verification and validation of activity data, emissions factors, and emission results after the completion of the inventory.

4.4 Uncertainty Assessment

In order to maximize resource allocation and enhance the quality of the inventory, it is critical to identify sectors that should be prioritized based on uncertainty estimates of GHG emission. Inventories prepared in accordance with the 2006 IPCC had a wide range of emission estimates that varied from carefully measured data to highly variable emissions factors. The main activity data used to build the national inventory were obtained from the official annual reports produced by the government institutions. Additional data were also obtained from international reports such as IEA and FAO reports.

For this inventory, a Tier 2 method for enteric fermentation of major livestock and forest land as well as a Tier 1 for the remaining of the sectors were used as required by the 2006 IPCC Guidelines. Based on the quality of the activity data and the default EFs used, uncertainty levels within the range recommended by the IPCC Guidelines were assigned for the two parameters (AD and EF). The combined uncertainty analysis has been conducted using the tool offered inside the IPCC 2006 software. During the inventory, in most

cases, the mid value recommended by the IPCC default EFs used in the IPCC Guideline were adopted for calculating uncertainty. In cases where IPCC recommended a particular methodology, the uncertainty level was derived according to the proposed procedure and used in uncertainty analysis. The trend uncertainty for the individual years of the period 2018 to 2020 varied from 12% to 15.4%, while the total inventory uncertainty for the years 2018 to 2020 ranged from 14.7% to 18.5%. The uncertainty assessment of the total inventory for the year 2018 was 12.5% and trend uncertainty was 18%.

4.5 General Assessment of Completeness

A source category analysis was conducted to identify activities in the four IPCC sectors responsible for emissions and sinks of GHG within of the selected economy sectors. All the key category of all sectors were addressed as a national during the development of the reports by participating experts from each line ministries. Moreover, the evaluation of the report development was done stepwise by the national technical expert group.

4.6 GHG Inventory Improvement Plan

The 2006 IPCC Guidelines for GHG Inventory will continue to be utilized for the development of the next GHG Inventory. The enhancement of the GHG inventory system follows a step-by-step approach. The institutional arrangement, as well as the collection, analysis, and archiving system for activity data related to the GHG inventory, is continuously reviewed and improved. Efforts will be focused on improving the disaggregation and completeness of the activity data in line with the 2006 IPCC Guidelines, and developing country-specific emission factors for key categories. Based on the constraints and gaps identified in the aforementioned sections, the following list of improvement plans has been identified:

1. Enhance the capacity of national experts to establish a database management system that ensures the availability of disaggregated, reliable, and high-quality data on GHG emissions. Create a platform for information exchange on climate change mitigation and adaptation activities.
2. Strengthen the capacity of academic institutions to actively engage in multidisciplinary programs and research on climate change prediction, adaptation, and mitigation. Incorporate climate change issues into the primary and secondary education curriculum.
3. Enhance the QA/QC system to ensure the quality and reliability of activity data collection and archiving.
4. Develop and implement a National GHG Inventory Improvement Plan for emission factors.

5. Expand the network of automatic weather stations in lowland regions to achieve better distribution and ensure reliable climate research and observations.
6. Continuously identify, track, and monitor new potential sources of emissions to include them in inventories, following IPCC guidelines.
7. Develop country-specific emission factors, particularly for key categories, to enhance the quality of the inventory and enable the adoption of higher Tier methods.
8. Conduct ongoing assessments of land use and land use change, given the dynamic nature of these activities in meeting rural community development and the country's economic growth.
9. Make continuous efforts to develop country-specific emission factors for crops in the agriculture sector.
10. Collect activity data for subcategories not yet reported in the IPPU sector, such as refrigeration and stationary air conditioning, and non-energy products from fuels and solvents.
11. Enable higher-tier calculations, especially for the energy industries and road transport subcategories within the energy sector.
12. Improve activity data and emission factors in the waste sector, particularly for key categories, to further enhance the accuracy of emissions estimations.

4.7 Overview of GHG Emissions

Ethiopia's total emissions were estimated at 350,843.9 GgCO2eq in 2018 and 262,384.50 GgCO2eq in 2020. The AFOLU sector was the most significant source of emissions for the three gasses (i.e., CO_2, CH_4 and N_2O), accounting for 82.5% of the total emissions in the year 2020 (Figure 4-1). The energy sector was the second most important GHG emission source (accounting for 12.27%). Contributions of the IPPU and waste sector were 1.68% and 3.55%, respectively.

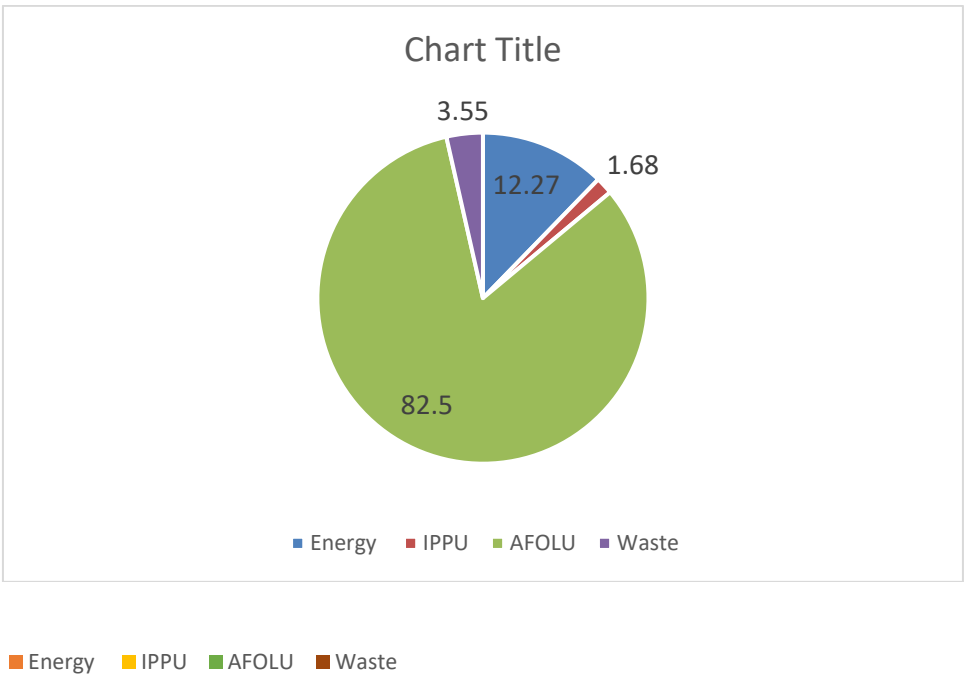


Figure 4-1: Total GHG emission by sector 2020

In the year 2020, expressed in terms of CO_2 equivalents, CH_4, CO_2, N_2O, and HFCs contributed 29.18%, 66.2%, 3.83%, and 0.79% of the total emissions, respectively. At the subsector level, the majority of CO_2 emissions originated from land-related activities, while CH_4 emissions were primarily attributed to livestock. This updated report includes data on HFCs emissions, which were not included in the country's previous NC3 report, and these emissions have been collected and analysed.

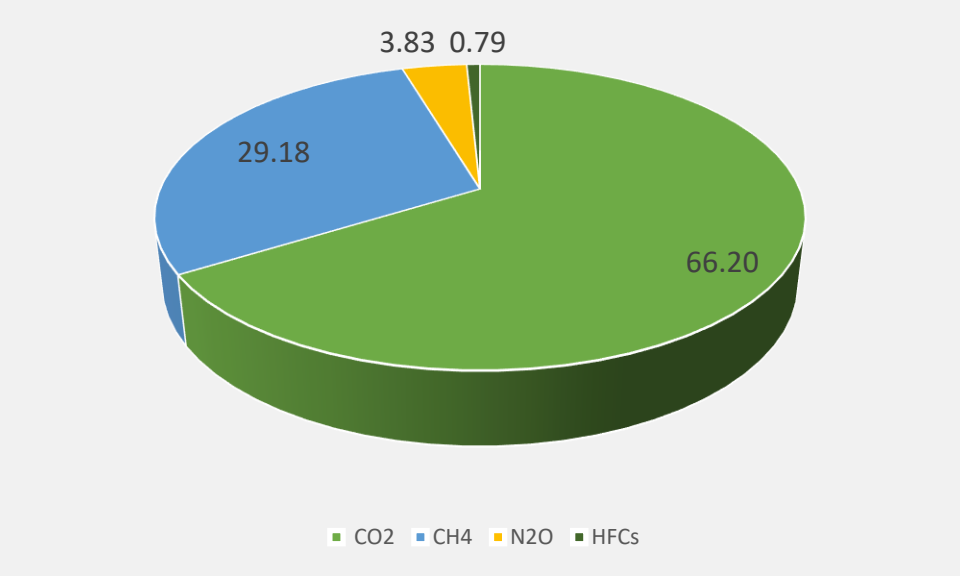


Figure 4-2: Total GHG emission by gasses 2020

4.8 Energy

Ethiopia is primarily reliant on biomass and renewable energy sources. The energy sector encompasses all activities involving fuel combustion from stationary and mobile sources. Currently, the sector is predominantly fuelled by biomass, such as fuelwood, charcoal, and agricultural residues, which are used for residential and commercial purposes. The emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) were calculated for this sector.

4.8.1 Methodology

Emission estimates were computed according to the 2006 IPCC guidelines for National Greenhouse Gas inventories Tier 1 approaches were used for calculation of GHG inventory.

4.8.2 The IPCC Reference Approach and the Energy Activity Data

This section provides the relevant activity data, emission factors, and methodologies for different categories of fuel combustion. The subcategories under fuel combustion include energy, electricity generation, manufacturing, and various transport industries such as road, rail, navigation, aviation, and commercial/residential sectors. The Reference Approach, which is a top-down method, is used to estimate net CO_2 emissions from the combustion of primary and secondary fuels supplied to the economy. This approach enables the calculation of emissions by analysing the overall national inventory of fuel supply. It is a straightforward methodology where emissions of greenhouse gases from the combustion of primarily fossil fuels can be estimated relatively easily using available energy supply statistics.

Data from the national energy balance were recalculated from natural units into energy units using the net calorific values specific to each fuel type. The calorific values used were sourced from the IPCC guidelines. Energy data used for the GHG Inventory, obtained from the International Energy Agency (IEA), is presented in Table 4-8: Ethiopia Energy Balance (2018 and 2020).

4.8.3 Emission Factors

The emission factors used for the calculation were taken from IPCC Guidelines (2006 IPCC Guidelines for National GHG Inventories). Net calorific values and emission factors used for estimating GHG emissions from the Energy sector by fuels; default EF for stationary combustion in commercial/institutions, default EF for stationary combustion in residential and agriculture, and Ethiopian energy balance are given from Table 4-4 to Table 4-8.

Table 4-4: Default Net Calorific Value (NCV) (Source 2006 IPCC Guideline, Table 1.2.)

Fuel Type	TJ/Gg
Naphtha	44.5
LPG	47.3
Motor Gasoline	44.3
Jet Kerosene	44.1
Other Kerosene	43.8
Gas/Diesel	43.0
Fuel Oil (Residual)	40.4
Other Bituminous coal	25.8
Primary Solid Biofuel (including Charcoal)	29.5
Liquid Biofuel	27

Table 4-5:Default EF for Stationary Combustion in Manufacturing Industries and Construction (Source 2006 IPCC Guideline Table 2.3)

Fuel Type	CO_2	CH_4	N_2O
Naphtha	73,300	3	0.6
LPG	63,100	1	0.1
Motor Gasoline	69,300	3	0.6
Jet Kerosene	71,500	3	0.6
Other Kerosene	71,900	3	0.6
Gas/Diesel	74,100	3	0.6
Fuel Oil (Residual)	77,400	3	0.6
Other Bituminous coal	94,600	10	1.5
Primary Solid Biofuel (Including Charcoal)	112,000	200	4
Liquid Biofuel	70,800	3	0.6

Table 4-6: Default EF for Stationary Combustion in Commercial/Institutional (Source 2006 IPCC Guideline Table 2.4

Fuel Type	CO_2	CH_4	N_2O
Naphtha	73,300	10	0.6
LPG	63,100	5	0.1
Motor Gasoline	69,300	10	0.6
Jet Kerosene	71,500	10	0.6
Other Kerosene	71,900	10	0.6
Gas/Diesel	74,100	10	0.6
Fuel Oil (Residual)	77,400	10	0.6
Other Bituminous coal	94,600	10	1.5
Primary Solid Biofuel (Including Charcoal)	112,000	200	1
Liquid Biofuel	70,800	10	0.6

Table 4-7: Default EF for Stationary Combustion in Residential and Agriculture (Source 2006 IPCC Guideline Table 2.5)

Fuel Type	CO_2	CH_4	N_2O
Naphtha	73,300	10	0.6
LPG	63,100	5	0.1
Motor Gasoline	69,300	10	0.6
Jet Kerosene	71,500	10	0.6
Other Kerosene	71,900	10	0.6
Gas/Diesel	74,100	10	0.6
Fuel Oil (Residual)	77,400	10	0.6
Other Bituminous coal	94,600	300	1.5
Primary Solid Biofuel (Including Charcoal)	112,000	200	1
Liquid Biofuel	70,800	10	0.6

Table 4-8: Ethiopia Energy Balance (2018 and 2020) Source: International Energy Agency, IEA

Sub Sector	Fuel Type	Unit	AD		
			2018	2019	2020

Industry	Naphtha	Tj	1,641	1,642	1,645
	Gas/Diesel Oil	Tj	37,326	37,946	37,240
	Residual Fuel Oil	Tj	2,503	2,516	1,520
	Other Bituminous	Tj	11,876	11,733	15,904
	Other Oil Products	Tj	11,597	11,520	12,753
Transport	Jet Kerosene	Tj	369	370	414
	Motor Gasoil	Tj	21,489	21,593	22,928
	Gas/Diesel Oil	Tj	79,103	79,640	83,192
	Other Liquid Biofuel	kt	6	6	6
Commercial	Gas/Diesel Oil	Tj	3,623	3,631	3,799
	Other Primary Solid Biofuel	Tj net	12,401	12,408	12,442
Residential	LPG	Tj	298	301	291
	Other Kerosene	Tj	2,698	2,762	2,730
	Other Primary Solid Biofuel	Tj net		1,465,614	1,498,018
Agriculture/Forestry	Gas/Diesel Oil	Tj	8,578	8,602	8,984
Other non-specified	Gas/Diesel	Tj	8,601	8,602	8,984
Non-energy used	Other Oil Product	Tj	4,243	4,249	4,556

4.8.4 Emissions by Categories

This section provides respective emissions, activity data and emission factors and methodologies for fuel combustion categories. The share of key category emissions of fuel combustion sub-categories mainly dominated by other sectors followed by transport and manufacturing industries and construction as shown in Figure 4-3 below.

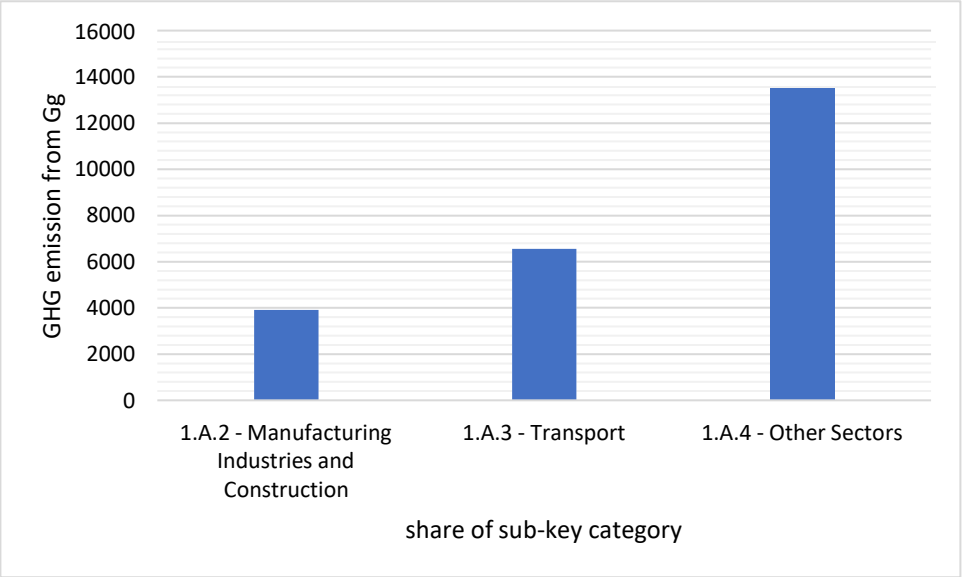


Figure 4-3: Emissions of Fuel Combustion sub-categories of 2020

In 2020, 40.11% of the total energy emissions came from other sectors, followed by the energy industries (34.19%), transport (19.6%), and manufacturing industries and construction (5.78%). The major contributor to emissions in the fuel combustion subcategory in 2020 included commercial/ institutional, residential, agriculture/forestry/ fishing and fish farms sectors that constituted 40.11%, while transport and manufacturing industries and construction contributed 19.6% and 5.78%, respectively.

Emissions by Gas

The CO_2 emission was the main contributor in the energy sector (61.97%) followed by CH_4 (31.52%) and N_2O (6.51%) Figure 4-4.

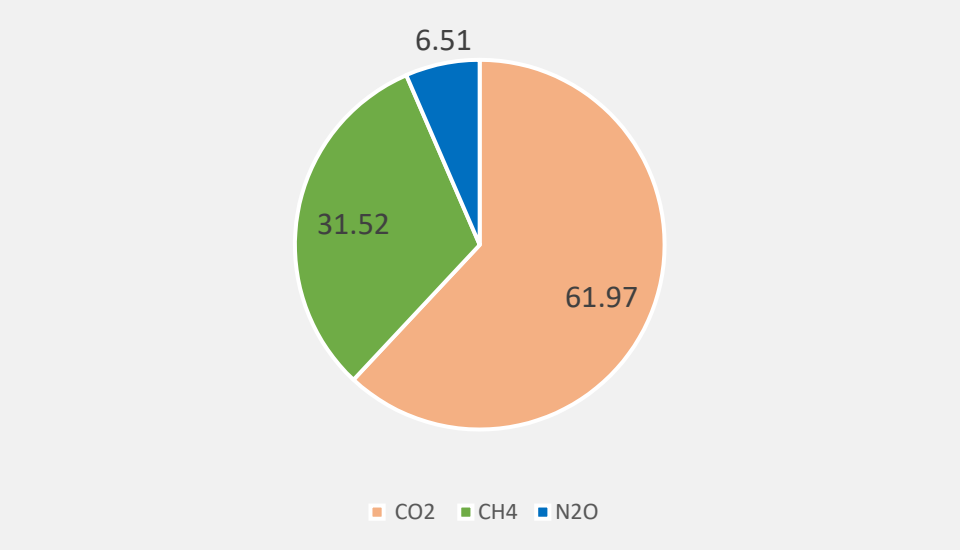


Figure 4-4: GHG emission from energy sector by gas (2020)

4.9 Industrial Processes and Product Use

The Greenhouse Gas (GHG) emissions from Industrial Processes and Product Use (IPPU) are mainly generated from mineral industries and wide variety of industrial activities. Cement production is the main source of GHGs emission in the key category followed by metal industries and to some extent from the lime productions. The Greenhouse Gas (GHG) emissions in the industrial processes were from raw materials are chemically transformed to final products. During these processes, different GHGs such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and HFCs are released into the atmosphere.

4.9.1 Methodology

The 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 3 was used in conjunction with the IPCC Good Practice Guidance. The decision tree in each source category was used to determine the tier level to be adopted for computing the GHG emissions. Tier 1 level was used due to lack of country specific emission factors. Activity data for the industrial processes covered in this inventory were obtained

mainly from the Ministry of Industry supplemented by information from the manufacturers of the products and finally approved by national statistics service.

4.9.2 Overall Emission Estimates under IPPU

Greenhouse gas (GHG) emissions are produced as by-products of non-energy industrial processes in which raw materials are chemically transformed to final products. During these processes different GHGs such as carbon dioxide (CO2), methane (CH4) or nitrous oxide (N2O) are released into the atmosphere. The GHG total emissions in this sector were estimated to be 4401.46 Gg CO2eq. These emissions constituted 1.68 % of the total national greenhouse gas emissions in 2020. The total GHG emissions from the IPPU sector were dominated by the emissions from the mineral industries category (2.A) mainly cement production contributes 93.69% of the total IPPU sector.

The general methodology applied to estimate emissions associated with each industrial process, was calculated according to the 2006 IPCC Guidelines, using the product amount of material produced or consumed, and an associated emission factor per unit of production/consumption. The activity data on production/consumption for particular industrial processes was obtained from the Ministry of Industry. Emission factors used for calculation of emissions are default emission factors from the 2006 IPCC Guidelines due to the absence of country specific emission factors.

4.10 Agriculture Forestry and Other Land Use (AFOLU)

This sector is unique in that it plays a linchpin role both on the emission and removal sides. The total emission in 2020 from the sector was 216,469.10 Gg CO2-eq. Carbon dioxide (69.6%) and Methane (28.26%) and nitrous oxide (2.14%) is the primary greenhouse gases emitted due to agricultural activities. High methane (CH4) emission occurs mainly as a result of enteric fermentation whereas agricultural soil management contributes to high nitrous oxide (N2O) emission in the agriculture sector. Domestic livestock are the major source of CH4 emissions from agriculture, both from enteric fermentation and manure management

4.10.1 Data Sources and Methodology

The main institutions and ministries contacted for the activity data collection were the Ethiopian Statistical Service, Space Science and Geospatial Institute and Ministry of Agriculture (MoA), Agricultural Research Centre, Ethiopian Forest Development, Ethiopian Environment and Forest Research Institute. IPCC 2006 guidelines and software were used for the preparation of the inventory.

4.10.2 Aggregated Emission Results in AFOLU Sector

Emissions by Category

In 2020, the highest emissions contribution was from land with 69.61% followed by livestock at 25.36%. The "Aggregate sources and non-CO_2 emissions sources onland "was the least as contributed only 5.04% as shown in Figure 4-5.

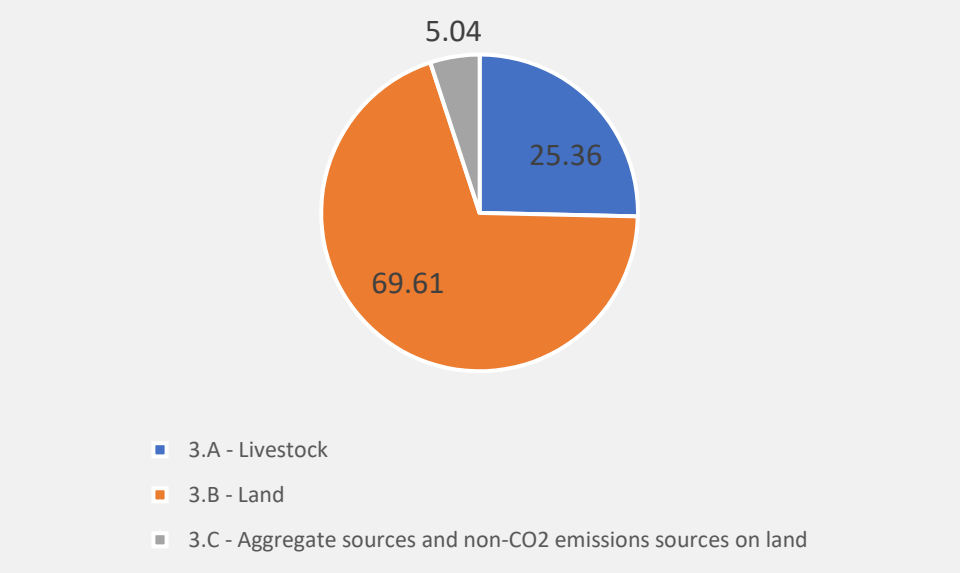


Figure 4-5: GHG emissions contribution of key category for AFOLU sector (2020)

Emissions by gas

In 2020, the most dominant gas across the timeline was CO_2 with 69.6% followed by CH_4 with 28.26% and N_2O with 5.14% of the year 2020 as showed in Figure 4-6 .

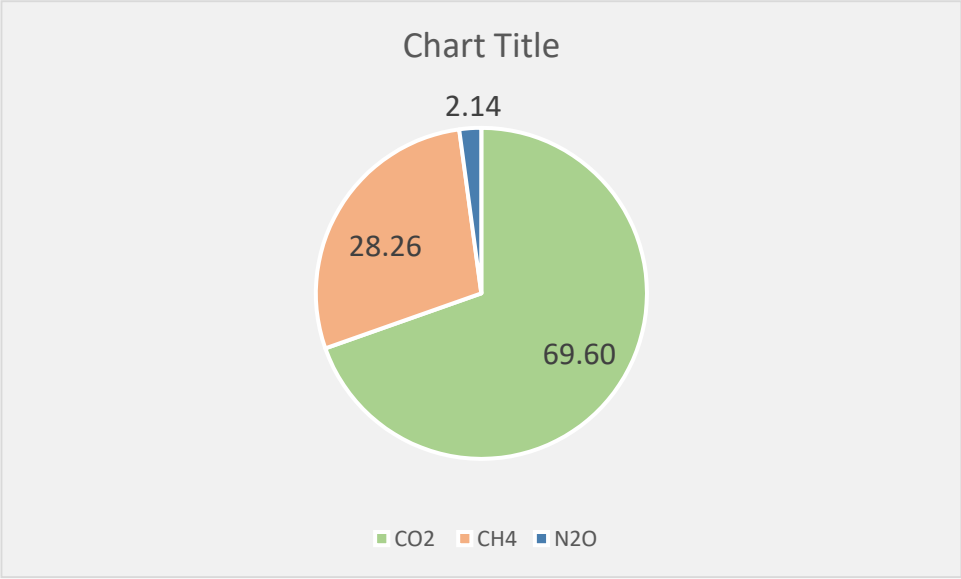


Figure 4-6: GHG emissions by gas of AFOLU sector (2020) in Gg CO2 eq

4.10.3 Livestock

Emissions from livestock are generated from enteric fermentation and manure management of domestic animals such as cattle, sheep, goats, horses, donkeys/asses and mules, camels and poultry.

Activity Data for the Livestock Subcategory

The Intergovernmental Panel on Climate Change (IPCC) recommends the use of a more advanced (Tier 2) method to quantify livestock GHG emissions in national GHG inventories. The livestock population category and subcategories were defined to create relatively homogenous sub-groupings of animals based on difference in production systems, breed, age, sex, production objective (dairy, meat, multipurpose) is given in Table 4-10. Based on IPCC classification for cattle the relevant categories in Ethiopia include high producing dairy cows (pure exotic), low producing (crossbreed), other cattle (indigenous multipurpose cattle); while other livestock species include sheep, goats, camels, horses, mules/ asses, and poultry. Most of the cattle populations in Ethiopia are indigenous types, but a small number of exotic dairy cattle breeds and crossbreeds are found in urban and suburban areas. Dairy cows in the Ethiopian context are defined here as mature cows (pure exotic and crossbreed) that produce milk in commercial quantities for human consumption (IPCC, 2006). In Ethiopia, the dairy cow population is comprised of two well-defined segments: (i) high- producing exotic dairy cow population found in urban and peri-urban commercial operations (commercial intensive); and (ii) low producing dairy cow population managed under medium input production system (smallholder intensive) (MoA, 2015). The dairy cow category does not include indigenous cows kept for multipurpose production (meat, milk and draft power) and cattle managed under pastoral production system. Ethiopia is a country with a distinctly different production system of four major production systems, i.e., the highland mixed crop livestock production, the pastoral and agro-pastoral production, commercial intensive and smallholder intensive systems.

Table 4-10: Classification of the cattle categories into subcategories and division

Livestock species category	Livestock species subcategory	Production system	Livestock division
Cattle	Dairy cow	Commercial intensive system	Adult pure exotic dairy cows (3-10 years)
		Commercial intensive system	Adult pure exotic males 3-10 years
		Commercial intensive system	Pure exotic calves (<6 months) male & female
		Commercial intensive system	Pure exotic calves (6 m - < 1 yr.) male & female

		Commercial	intensive system		Pure exotic growing males (1 - < 3 years)		
		Commercial system	intensive		Pure exotic growing females (1 -< 3 years)		
		Smallholder	intensive system		Adult pure exotic dairy cows (3-10 years)		
		Smallholder	intensive system		Adult pure exotic males 3-10 years		
		Smallholder	intensive system		category not used		
		Smallholder	intensive system		Pure exotic calves (<6 months) male & female		
		Smallholder	intensive system		Pure exotic calves (6 m - < 1 yr.) male & female		
		Smallholder	intensive system		Pure exotic growing males (1 - < 3 years)		
		Smallholder	intensive system		Pure exotic growing females (1 -< 3 years)		
	Other cattle	Pastoral & agro pastoral system			Adult multipurpose cows >3 years		
		Pastoral & agro pastoral system			Adult males used for draught (3-10 years)		
		Pastoral & agro pastoral system			Adult males used for breeding & other purpose (>3-10 years)		
		Pastoral & agro pastoral system			Pre-weaning calves < 6 months (male & female)		
		Pastoral & agro pastoral system			Post-weaning calves (6 m-1 yr.) male & female		
		Pastoral & agro pastoral system			Growing males 1-3 years		
		Pastoral & agro pastoral system			Growing females 1-3 years		
		Mixed crop	livestock system		Adult multipurpose cows >3 years		
		Mixed crop	livestock system		Adult males used for draught (3-10 years)		
		Mixed system	crop	livestock	Adult males used for breeding & other purpose (>3-10 years)		
		Mixed system	crop	livestock	Pre-weaning calves < 6 months (male & female)		
		Mixed system	crop	livestock	Post-weaning calves (6 m-1 yr.) male & female		
		Mixed system	crop	livestock	Growing males 1-3 years		
		Mixed system	crop	livestock	Growing females 1-3 years		
		Mixed system	crop	livestock	Adult males (>3 years) smallholder Feedlot		
		Mixed system	crop	livestock	Adult males' commercial feedlot	(>3	years)

The estimated cattle populations were obtained from the central statistical service and MoA for the years 2018 to 2020. Seasonal births or slaughters may cause the population size to expand or contract at various times of the year, which required the population numbers to be adjusted to the original form of the population data as it was received from farmers, the Central Statistical Service and from other sources, and the adjustment was made by the MoA. The population data for other livestock categories (sheep, goats, camels, houses and mule/asses) was obtained from the Central Statistical Service.

4.10.3.1 Enteric Fermentation

Methane is produced by herbivores as a by-product of enteric fermentation, a digestive process by which carbohydrates are broken down by microorganisms into simple molecules for absorption into the bloodstream. Enteric fermentation is the primary source of methane emission from the agricultural sector accounting 22.73% of the total CH_4 emissions derived from the agriculture sector.

Methodological Issues

The amount of methane emitted from enteric fermentation is driven primarily by the number of animals. Methane emission from enteric fermentation was calculated using a Tier 1 method, for all species using Equation 10.19, according to the provisions in the 2006 IPCC Guideline. Total Methane (CH_4) emission from Enteric Fermentation was calculated using Equation 10.20 according to 2006 IPCC Guideline:

Activity Data

Emission from enteric fermentation was calculated using national Livestock population data (Dairy cattle, Non-Dairy cattle (Other Cattle), Sheep, Goat, Camel, Horse, Donkey, Mule and Poultry) from Ethiopia Central Statistics Agency.

As shown in Table 4-12 and Table 4-13 enteric CH_4 emission factors for adult multipurpose dairy cows were lower than those for adult pure exotic dairy cows. Differences in breed, feed intake and feed types, animal management, and body size have contributed to the lower enteric CH_4 emission factors for adult multipurpose dairy cows. Foraging requires a lot of energy in the pastoralist/agro pastoralist and mixed agricultural livestock systems that may cause the cattle's higher CH_4 emission in dairy cows.

The amount of methane emitted from enteric fermentation is primarily driven by the number of animals (Table 4-11). Methane emission from enteric fermentation was calculated using the Tier 1 method for all species according to the provisions in the 2006 IPCC Guideline.

Table 4-11: Livestock Population for the year (2018 to 2020) (Source Ethiopian Statistics Service)

Livestock Category	Year		
	2018	2019	2020
Dairy	11,886,900	12,575,143	15,041,686
Non-Dairy	50,791,581	52,778,947	55,250,090
Sheep	33,020,392	39,894,394	42,914,865
Goat	38,963,879	50,501,672	52,463,535

Camel	6,760,870	7,702,493	8,145,790
Horse	1,930,808	2,111,134	2,148,492
Donkey	9,765,865	9,987,762	10,791,896
Mules	225,993	357,603	382,784
Poultry	46,420,266	48,955,675	56,992,987

As shown in Table 4-12 enteric CH_4 emission factors for adult multipurpose dairy cows were lower than those for adult pure exotic dairy cows. Differences in breed, feed intake and feed types, animal management, and body size have contributed to the lower enteric CH_4 emission factors for adult multipurpose dairy cows. Foraging requires a lot of energy in the pastoralist/agro pastoralist and mixed agricultural livestock systems that may cause the cattle's higher CH_4 emission in dairy cows.

Emission Factor

Country specific emission factor to estimate methane (CH_4) emission from enteric fermentation is not available for Ethiopia so default enteric fermentation factor for all livestock species was used from 2006 IPCC Guideline (Table 10.10 and Table 10.11)

Table 4-12: Default Enteric Fermentation Emission factors for methane emission Source - 2006 IPCC Guideline

Livestock Type	**Enteric Fermentation Emission Factor (CH_4/head/yr)**	**2006 IPCC Guideline**
Dairy Cattle	46	Table 10.11
Non-Dairy	31	Table 10.11
Sheep	5	Table 10.10
Goats	5	Table 10.10
Camels	46	Table 10.10
Horse	18	Table 10.10
Asses/Donkey	10	Table 10.10
Mules	10	Table 10.10

Emissions factors calculated for sheep, goats, horses, donkeys and poultry are identical to those found in the IPCC Guidelines default tables (IPCC, 2006) as indicated in Table 4-13 below.

Table 4-13: Emission factor for the other livestock subcategory

Type of Livestock	Emission Factor Enteric Fermentation (CH_4/head/yr.)
Sheep	5
Goats	5
Pigs	1
Rabbits	0
Asses	10
Camels	46
Poultry	0

4.10.3.2 Manure Management

Livestock manure is an important source of methane (CH_4) and nitrous oxide (N_2O). The amount of CH_4 and N_2O emitted from the manure to the atmosphere depends on the conditions of manure management and as well as on the composition of released excrements. Methane (CH_4) emission in manure management is generated under the conditions of anaerobic decomposition of manure. Direct N_2O emissions occur via combined nitrification and denitrification of nitrogen contained in the manure, which is dependent on storage and treatment types and methods. In our country, the manure management system was not well established, and it was wasted as dang and used for different purposes as a source of energy. Manure storing methods, in which anaerobic conditions prevail, are favourable for anaerobic decomposition of organic substance and release of methane. Methane emission from manure management for the period 2020 was accounts about 2.61% of the total livestock key category.

Methane Emissions

Methodological Issues

The 2006 IPCC methodology, Tier 1 method was used to calculate methane (CH_4) emission from manure management using Equation 10.22 according to 2006 IPCC Guideline.

The activity data used to estimate methane (CH_4) emission from manure management was collected from Ethiopia Central Statistics service. Default emission factor from 2006 IPCC Guideline table 10.14 and 10.15 (Table 4-14), Methane emission Factor for Manure Management was used.

Table 4-14: Methane emission Factor for Manure Management Source – 2006 IPCC Guideline

Livestock Type	**Methane Emission Factor (kg head^{-1} yr^{-1})**	**2006 IPCC Guideline**
Dairy Cattle	1	Table 10.14
Other Cattle	1	Table 10.14
Sheep	0.2	Table 10.15
Goat	0.22	Table 10.15
Camels	2.56	Table 10.15
Horse	2.19	Table 10.15
Mules/Asses	1.2	Table 10.15
Poultry	0.02	Table 10.15

Nitrous Oxide Emissions

There are both direct and indirect N_2O emissions from manure that occur after excretion. Indirect emissions of N_2O result from volatile N losses in the form of ammonia (NH3) and nitric oxides (NOx) that are lost during manure storage and management and deposited somewhere else, where those subsequently can lead to additional N_2O emissions. The Tier1 calculations of N_2O emissions from manure management are based on the total amount of N excreted from all livestock categories that is managed in different MMS and which is multiplied with emission factors for each MMS.

Direct N_2O *Emission Factor*

Animal population data, activity data, and MMS data were used to compute the nitrous oxide emissions from the management of manure. The Ministry of Agriculture offered information on manure management

storage solutions for several types of cattle. As some MMS (such as liquid/slurry systems) are particularly sensitive to temperature fluctuations, a country average temperature of 20 ^{o}C was utilized as it is an average temperature for the range stated in the GHG Guideline by the Ministry of Agriculture (MoA, 2015).

Methodological Issues

Direct N_2O emissions from manure management were estimated using Tier 1 methodology (Equation 10.25) according to the 2006 IPCC Guideline.

Activity Data and Emission Factor

National Livestock population data was used from Ethiopia Central Statistics service (Table 20. Livestock Population for the year 2006 – 2010, section 3.2.1) for the estimation Direct N_2O emission from Manure Management. In addition, to calculate Annual Excretion rate for all Livestock Species Equation 10.30 (from the 2006 IPCC Guideline) was used with default nitrogen excretion rate and Typical animal mass (Table 10A-4, 10A-5 and 10A-9 (from the 2006 IPCC Guideline)) (Table 4-15 Nitrogen Excretion Rate and Typical Animal Mass) from 2006 IPCC Guideline, due to the absence of country specific data.

Table 4-15: Nitrogen Excretion Rate and Typical Animal Mass Source – 2006 IPCC Guideline

Livestock	**Nitrogen Excretion Rate**	**2006 IPCC Guideline**	**Typical Animal mass**	**2006 IPCC Guideline**
Dairy Cattle	0.6	Table 10.19	275	Table 10-4
Other Cattle	0.63	Table 10.19	173	Table 10-5
Sheep	1.17	Table 10.19	28	Table 10-9
Goat	1.37	Table 10.19	30	Table 10-5
Camel	0.46	Table 10.19	217	Table 10-9
Horse	0.46	Table 10.19	238	Table 10-9
Mules/Asses	0.46	Table 10.19	130	Table 10-9
Poultry	0.82	Table 10.19	0.9	Table 10-9

However, data on manure management systems for all livestock species were sourced from Ethiopia's Second National Communication submitted to the United Nations Framework Convention on Climate Change in 2015, as country-specific data is not available.

Indirect emissions from manure management **–** N_2O

Indirect N_2O emissions are the result of the second pathway in which nitrous oxide (N_2O) is emitted from manure management. These emissions occur through volatile nitrogen losses in the form of ammonia and NOx, as well as losses through runoff and leaching into soils. In the year 2020, the indirect N_2O emissions from managed soil and manure management were approximately 204.86 Gg CO_2eq and 645.93 Gg CO_2eq, respectively.

The Tier 1 methodology, as outlined in the 2006 IPCC guidelines, was used to calculate the indirect N_2O emissions from manure management. The volatized nitrogen in the forms of NH3 and NOx was calculated for all livestock categories using Equation 10.26 according to 2006 IPCC guideline. Similarly, N_2O emissions were then estimated using Equation 10.27 (2006 IPCC guidelines), using default emission factors (Table 11.3, 2006 IPCC guidelines).

The same activity data used in estimating direct N_2O emission was used to calculate indirect N_2O emission from manure management whereas default emission, (Table 11.3) was used from the 2006 IPCC Guideline.

4.10.4 Managed Soils

Direct emissions – N_2O

Several agricultural activities contribute to the nitrogen content in soils through various means, such as the application of synthetic and organic fertilizers, the deposition of manure from grazing animals, the use of crop residues, and the management of organic soils, which can lead to the mineralization of nitrogen in soil organic matter. These activities increase the availability of nitrogen for nitrification and denitrification processes, ultimately resulting in the emission of N_2O.

The emissions of nitrous oxide from managed soils occur through two main pathways: direct and indirect N_2O emissions. Direct N_2O emissions from managed soils are a result of the total amount of nitrogen applied to the soil through human-induced nitrogen additions or changes in agricultural practices. In the case of Ethiopia, the specific nitrogen sources considered for estimating N_2O emissions from managed soils are:

- Inorganic nitrogen fertilizers

- Organic nitrogen fertilizers
- Urine and dung deposited by grazing animals
- Nitrogen from crop residues

However, the estimation of nitrous oxide emissions from the cultivation of organic soils and the mineralization/immobilization associated with the loss/gain of soil organic matter resulting from changes in land use or the management of mineral soils was not conducted, as this activity is not prevalent in Ethiopia. In 2020, about 287.50 Gg CO_2eq. of the direct N_2O emission from managed soils occurred as a result of manure deposited by grazing animal followed by organic nitrogen applied as fertilizer.

Table 4-16: Emission factor used to estimate Direct N_2O emission from Managed soil

Emission factor for N_2O emissions from N inputs	**kg N_2O-N (kg N input)$^-$**	**2006 IPCC Guideline**
EF1 for N additions from mineral fertilisers, organic amendments and crop residues, and N mineralised from mineral soil as a result of loss of soil carbon [kg N_2O–N (kg N)-1]	0.01	Table 11.1
EF3PRP, CPP for cattle (dairy, non-dairy and buffalo), poultry and pigs [kg N_2O–N (kg N)-1]	0.02	Table 11.1
EF3PRP, SO for sheep and 'other animals' [kg N_2O–N (kg N)-1]	0.01	Table 11.1

Methodological issues

Direct N_2O emission from Managed Soils was calculated using Tier 1 methodology, Equation 11.1 from the 2006 IPCC Guideline and default emission factor was used from the 2006 IPCC Guideline.

Fraction of N in Synthetic fertilizer

Nitrous oxide emission from synthetic fertilizer was estimate based on the amount of N in synthetic fertilizer that is annually used in the country. Data on the annual consumption of synthetic fertilizers was obtained from the annual Farm Management practice Report published by the Ethiopian Central Statistics service from the year 2018-2020.

Indirect emissions – N_2O

Direct N_2O emissions are estimated separately from indirect emission, though both use the same set of activity data. Calculations of indirect N_2O emission from nitrogen used in agriculture are based on two pathways. These are:

- volatilization and subsequent atmospheric deposition of NH3; and
- leaching and runoff of the nitrogen that is applied to or deposited on soils.

Volatilization of N as NH3 and oxides of N (NOx) and the deposition of these gases and their products NH4+ and NO3- onto soils. Leaching and runoff from land of N from synthetic and organic fertilizer additions, crop residues, mineralization of N associated with loss of soil C in mineral and drained/managed organic soils through land-use change or management practices, and urine and dung deposition from grazing animals. Some of the inorganic N in or on the soil, mainly in the NO3 - form, may bypass biological retention mechanisms in the soil/vegetation system by transport in overland water flow (runoff) and/or flow through soil macrospores or pipe drains.

Table 4-17: Emission Factor and fraction used for Indirect N_2O emission from managed soil (Source IPCC 2006 guideline)

Fraction/emission factor		**Value**	**2006 IPCC Guideline**
Fraction of synthetic fertilizer N that volatilises	FracGASF	0.1	Table 11.3
Fraction of applied organic N fertilizer materials (FON) and of urine and dung N deposited by grazing animals (FPRP) that volatilises	FracGASM	0.2	Table 11.3
Emission factor for N_2O emission from atmospheric deposition of N on soils and water surfaces	EF4	0.01	Table 11.3
Fraction of all N additions to managed soils that is lost through leaching and runoff	FracLEACH-(H)	0.3	Table 11.3
Emission factor for N_2O emission from N leaching and runoff	EF5	0.0075	Table 11.3

4.10.5 Urea Application – CO_2

In addition to N_2O emissions from managed soils, adding urea during fertilization results in conversion of (CO(NH2)2) into ammonium (NH4+), hydroxyl ion (OH-), and bicarbonate (HCO3-), in the presence of water and urease enzymes. Similar to the soil reaction following addition of lime, bicarbonate that is formed evolves into CO_2 and water. Emission of CO_2 from urea application for the period 2020 was insignificant (0.07Gg CO_2-eq.)

Methodological issues

CO_2 emissions resulting from application of fertilizers was estimated using Tier 1 methodology, using Equation 11.13 from the 2006 IPCC Guidelines, using default emission factors.

Activity Data and emission factors

Activity data for applied urea was taken from Ethiopia Central Statistics service for the estimation of Direct N_2O emission from managed soils. Default emission factor (EF) of 0.02 for carbon emissions from urea applications was used from the 2006 IPCC Guideline.

4.10.6 Land

Carbon dioxide emissions are a result of human-induced changes in landscapes, particularly land use changes. This section provides estimates of emissions and removals from the Land category, using the 2006 IPCC Guidelines for the six land use categories: forestland, cropland, grassland, wetlands, settlements, and other land. In preparing this inventory, Ethiopia adopted national definitions of land uses that align with the definitions provided in the IPCC 2006 Guidelines, as outlined below:

Forestland: This category includes all land areas with a tree cover (including bamboo) spanning more than 0.5 hectares. The minimum width of the tree cover should be 20 meters or not more than two-thirds of its length. Forestland is characterized by trees reaching a height of more than 2 meters and a canopy cover of more than 20%. These criteria are based on the Minutes of Forest Sector Management (MEFCC, Feb. 2015) and the Ethiopian FREL 2017.

Cropland: This category encompasses land parcels that are currently used for cultivation or fallow, including certain agroforestry systems where the vegetation structure does not meet the thresholds for the forestland category. Cropland includes areas where over 50% of the defined area is used for crop agriculture. It is further divided into perennial cropland, mainly consisting of fruit trees, and annual cropland, which includes a mix of cereals, pulses, root crops, oilseeds, and vegetables.

Grassland: This category comprises land predominantly covered by grass, including rangelands and pastures that are not classified as cropland or forestland. It also includes areas with a combination of grass and herbaceous plants that do not meet the threshold values for the forestland category, such as other wooded land.

Wetland: This category refers to land covered or saturated by water for all or part of the year, excluding forestland, cropland, grassland, and settlements. Wetlands in this inventory primarily consist of reservoirs or managed flooded areas.

Settlement: This category encompasses all developed land, including transportation and industrial infrastructure, as well as human settlements.

Other lands: This category includes land covered by bare soil, rock, and any land areas that do not fall into the aforementioned five categories.

All land within Ethiopia was classified into these six IPCC land categories, and for this inventory, all land is considered managed land. This means that emissions and removals have been accounted for in the compilation. The land cover change data from the Ethiopian Geospatial Information Institute served as the basis for land use and land use change and forestry analyses.

Tier 2 EFs were used for the forest sector (Table 4-18). Above ground biomass data for natural forests were taken from the Ethiopian FREL Document (2017) submitted to the UNFCCC, and values for above ground biomass (AGB) were derived from weighted averages based on data from forest biomes.

Table 4-18: Tier 2 emission factors for forest sector

Carbon pools, Wood density and growth stock	Emission Factors	Data Sources
AGC (tc/ha)	70.1	MEFCC, 2018 (Weighted average of the four biomes
BGC (tc/ha)	18.9	MEFCC, 2018 (Weighted average of the four biomes
DOC (tc/ha)	1.7	MEFCC, 2018 (Weighted average of the four biomes
SOC (tc/ha)	60.3	MEFCC, 2018 (Weighted average of the four biomes
Litter (tc/ha)	4.1	MEFCC, 2018 (Weighted average of the four biomes
AGB in Forests (tc/ha)	125	MEFCC, 2018
Growing Stock level (m^3/ha)	128.3	MEFCC, 2018

4.10.6.1 Data source and methodology

The two land-use land cover maps (Figure 4-8 and Figure 4-9) are the main source of activity data for land category inventory. Land areas are represented using the IPCC Approach 3 (total land-use area, including changes between categories) for the six identified IPCC land use categories or sub-categories per ecological zone. IPCC Approach 3 provides an assessment of both the net losses and gains in the area of specific land-use categories and what these conversions represent (i.e., changes both from and to a category) and spatially explicit LULC change.

Having spatially explicit LULC change detection (Figure 4-8 to Figure 4-10) and LULC transition matrix (Table 4-19) leads to Approach 3 (The last approach) of activity data generation according to the IPCC GPG Document (IPCC, 2006). The LULC maps for the year 2018 and 2020 are presented below (Figure 4-8 to Figure 4-10).

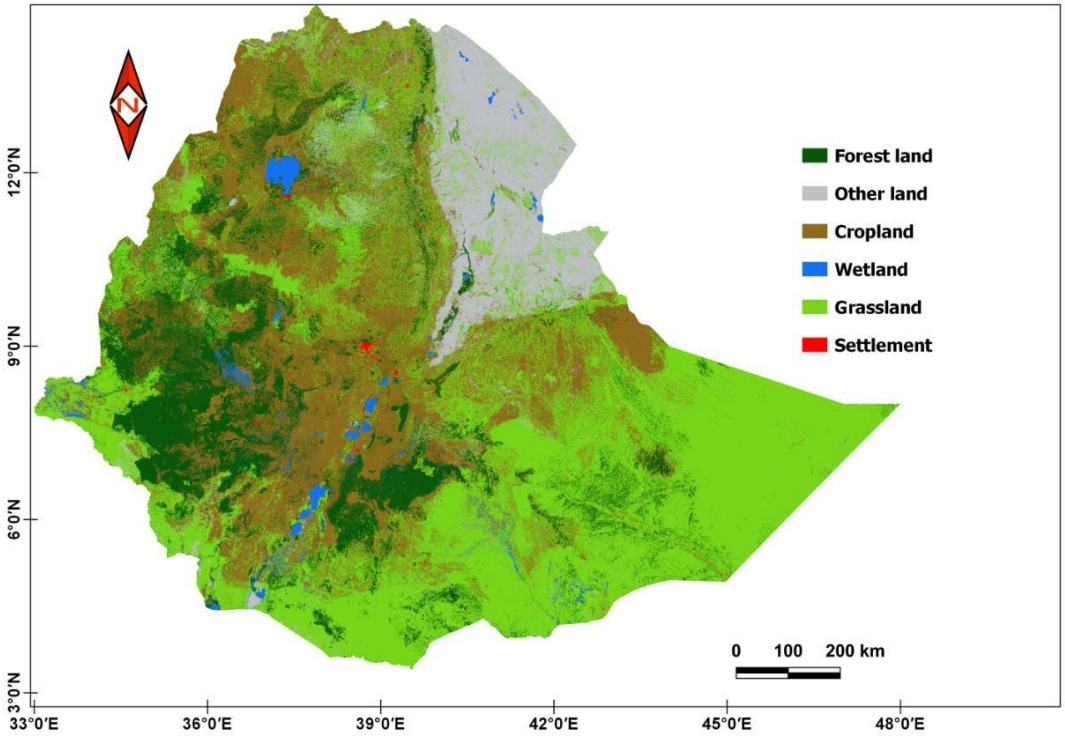


Figure 4-8: LULC map for the year 2018 (SSGI, 2018)

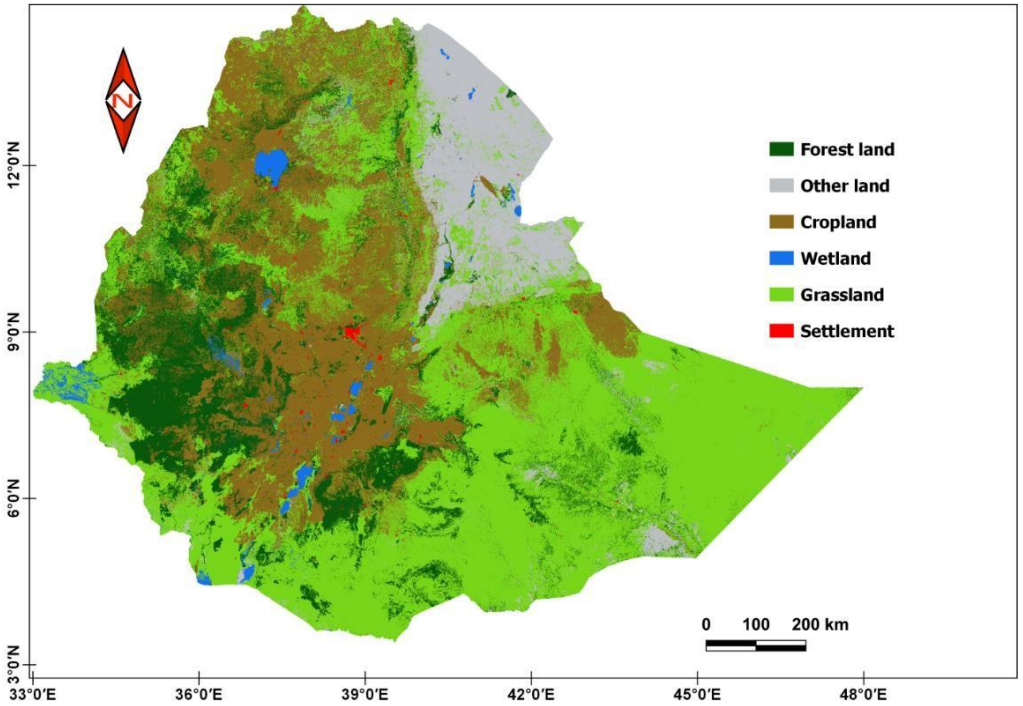


Figure 4-9: LULC map for the year 2020 (SSGI, 2020)

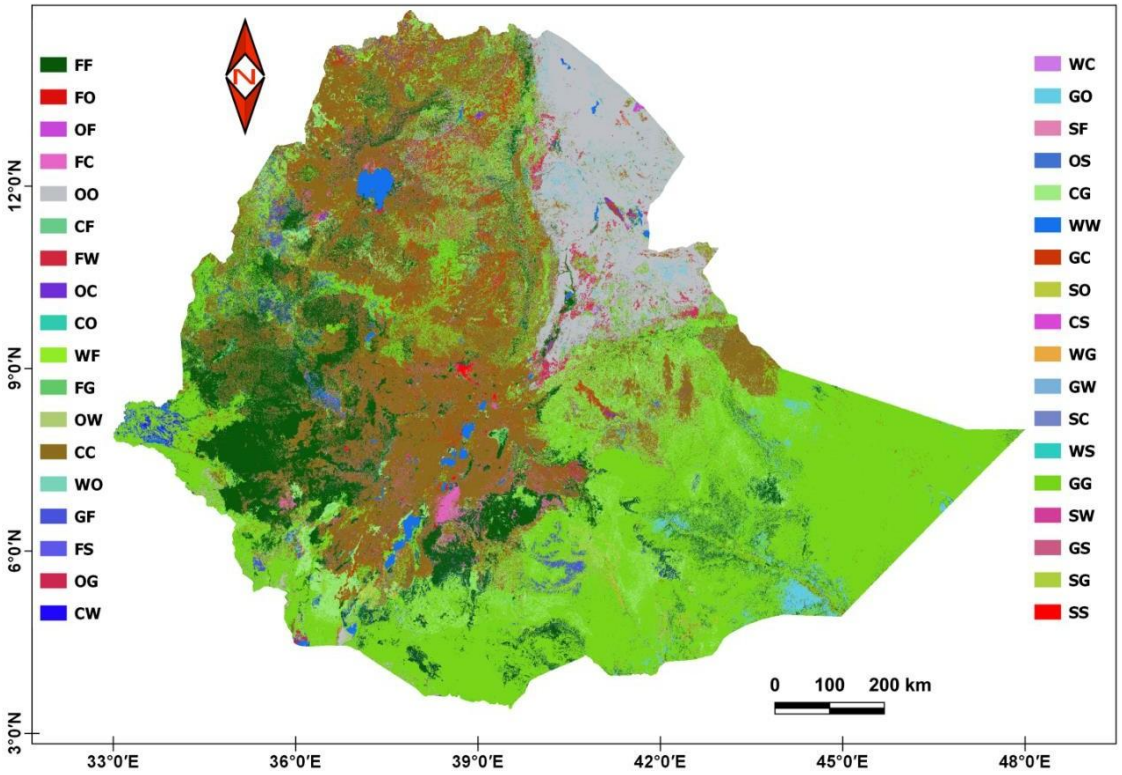


Figure 4-10: LULC change map for the period 2018-2020 (36 classes)

Land change

FF = Forestland remaining forestland

CC = Cropland remaining Cropland

GG = Grassland remaining grassland

SS = Settlement remaining settlement

WW = Wetland remaining wetland

OO = Other land remaining other land

FC = Forestland converted to cropland

FG = Forestland converted to grassland

FS = Forestland converted to settlement

FW = Forestland converted to wetland

FO = Forestland converted to other land

CF = Cropland converted to forestland

CG = Cropland converted to grassland

CS = Cropland converted to settlement

CW = Cropland converted to wetland

CO = Cropland converted to other land

GF = Grassland converted to forestland

GC = Grassland converted to cropland

GS = Grassland converted to settlement

GW = Grassland converted to wetland

GO = Grassland converted to other land

SF = Settlement converted to forestland

SC = Settlement converted to cropland

SG = Settlement converted to grassland

SW = Settlement converted to wetland

SO = Settlement converted to other land

WF = Wetland converted to forestland

WC = Wetland converted to cropland

WG = Wetland converted to grassland

WS = Wetland converted to settlement

WO = Wetland converted to other land

OF = Other land converted to forestland

OC = Other land converted to cropland

OG = Other land converted to grassland

OS = Other land converted to settlement

OW = Other land converted to wetland

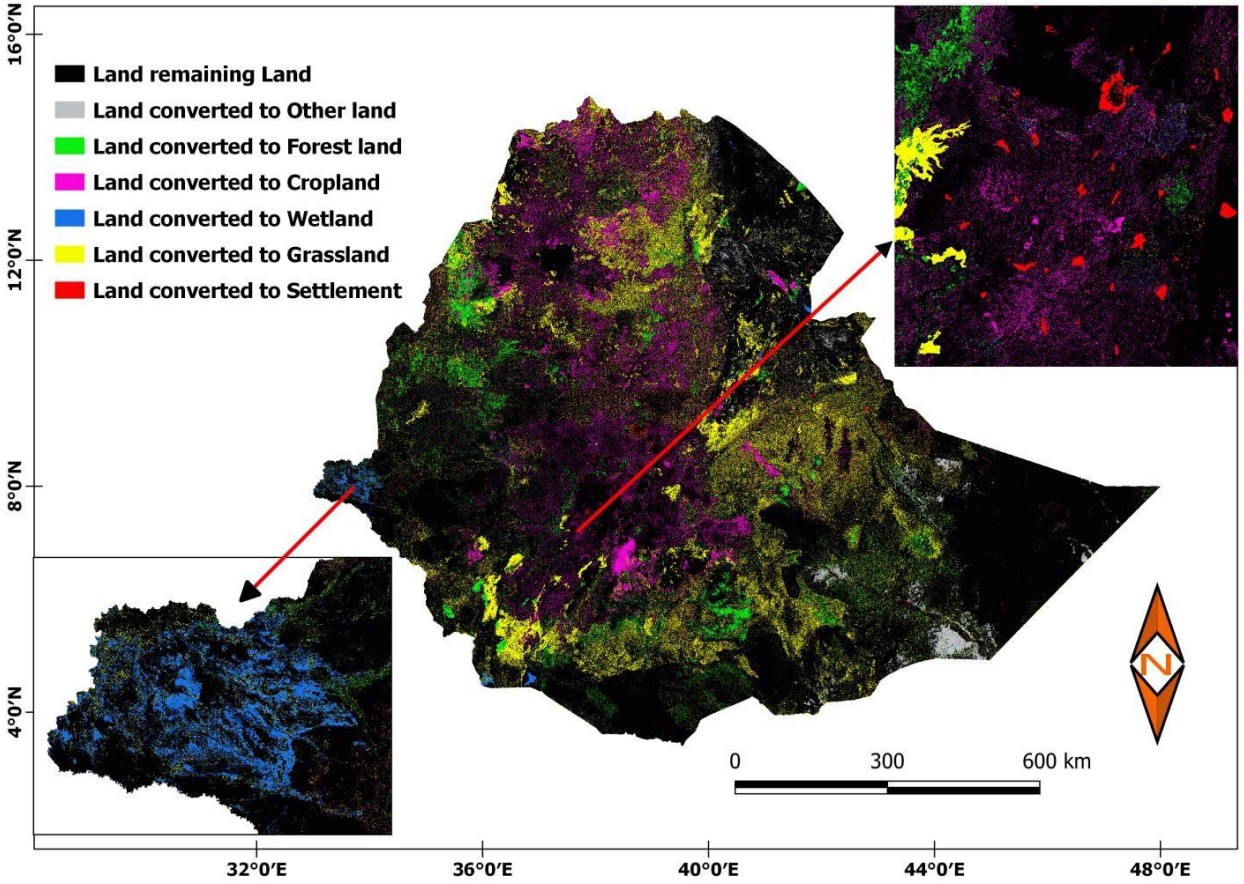


Figure 4-11: LULC change map for the period 2018-2020 (7 classes) with two zoomed in areas

The main dataset for the land categories was derived from the processing of satellite imageries for the years 2018 and 2020 (SSGI). Raster data derived from supervised classification of Landsat 8 imagery covering the years 2018 and 2020 were included in the preparation of this FBUR. This means that land-use maps for the years 2018 and 2020 were produced from wall-to-wall remote sensing and GIS ground-truthing. Activity data used for the land were generated from GIS data maps produced for 3-time steps, for the years 2018, and 2020.

Post-classification change detection was undertaken to derive LULC change between the years 2018 and 2020. A pixel-based approach was adopted to enable tracking of land use changes showing the exact areas of change, transition among classes and areas and creating LULC change maps. In order to retain consistency among GHG estimates reported for different years, the total land area was adjusted using a

80

proportional approach to the area covered by all the data sets. The adjusted data allowed for the establishment of land use matrices of the years 2018 to 2020 as shown in Table 4-19 below.

Table 4-19: Land use land cover transition matrix for the period 2018 -2020 (ha)

Year	2018							
2020		Forest land	Other land	Cropland	Wetland	Grassland	Settlement	Total
	Forest land	13,601,318	148,574	1,254,599	42,241	1,993,420	1,853	17,042,005
	Other land	97,925	10,076,749	266,759	11,745	1,641,717	64	12,094,960
	Cropland	1,728,400	527,454	23,322,013	118,854	3,640,157	6,520	29,343,398
	Wetland	45,949	46,644	199,567	1,077,928	58,985	48	1,429,122
	Grassland	1,585,103	1,699,598	7,454,044	349,039	41,985,396	3,899	53,077,078
	Settlement	24,032	8,475	94,971	1,951	56,722	146,816	332,966
	Total	17,082,726	12,507,495	32,591,953	1,601,759	49,376,397	159,199	113,319,530

4.10.6.2 Forest Land

According to the IPPC software, forest land is subdivided into six subcategories namely; forest land remaining forest land; land converted to forest land; cropland converted to forest land; grassland converted to forest land; wetlands converted to forest land; settlements converted to forest land; and other land converted to forest land.

Methodological Issues

In this inventory, the IPCC Gain and Loss Method (Equation 2.4, page 2.9, Vol 4, IPCC 2006 Guidelines was used to produce estimates of forestland and calculations were performed using the IPCC Inventory software (Version 2.69). Gain-Loss Method (Tier 1) Equation 2.7 was used to estimate annual change in carbon stocks in living above- and below-ground biomass, considering the region-specific data on mean annual increment. Ethiopia used country specific values for AGB and growth rates, commercial cutting, fuelwood removal for forest land. However, for the biomass expansion factors (BCEFI, BCEFR) and basic wood densities (D), and default root-to-shoot ratios (R) and carbon fractions (CF), IPCC values were used.

The annual biomass loss is a sum of losses from commercial round wood felling fuelwood gathering and other losses in forest land was calculated by using the following Equation 2.11 of Volume 4 of the 2006 IPCC guidelines. For example, commercial round wood was calculated in different worksheets as well as fuelwood gathering and other losses according to the Equation 2.12, Equation 2.13 and Equation 2.14 respectively. The calculations of biomass losses are consistent with the IPCC 2006 Guidance for AFOLU (Vol 4). Biomass gains and biomass losses are estimated separately. Tier 2 Soil Organic Carbon (SOC), Deadwood and litter values were used.

Emissions and Removals

Forest Land includes carbon stock gains from afforestation/reforestation, restoration and sustainable forest management and losses from deforestation and overall is the most significant net sink in the Land Inventory. The estimated CO_2 emissions from forest land (FL) was 99,106.78165Gg and removals was -124,044.1851 Gg CO_2 in 2020 (Figure 4-12)

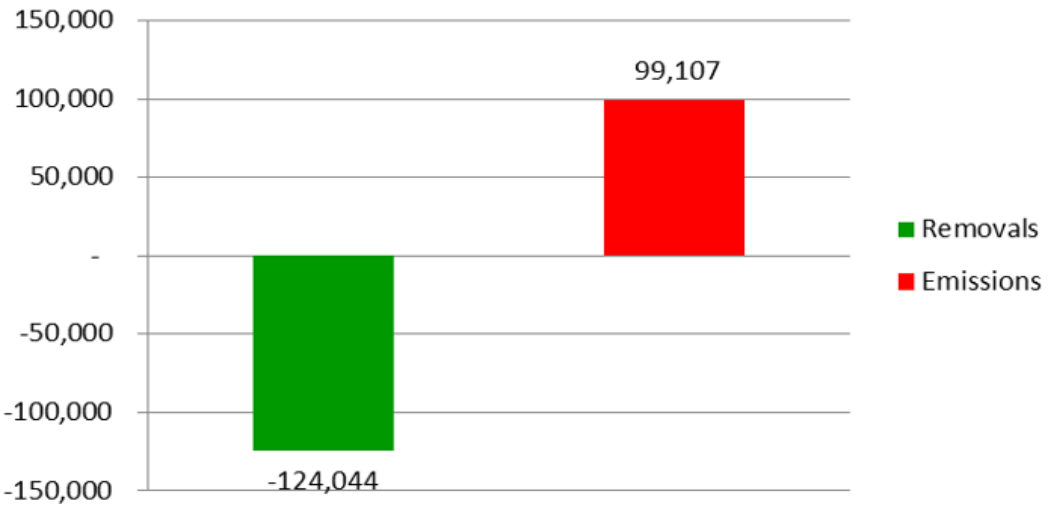


Figure 4-12: Emissions and removals from forestland from 2018 to 2020)

Forest land was the largest source of net CO_2 emission (40.28%) in the land category (Table 4-20).

Table 4-20: Total area conversion to forestland subcategory (ha)

Activity	Area (ha) in 2020
Total Area of Forest land	17,042,005
Forest land Remaining Forest land	13,601,318
Land Converted to Forest land	3,440,688
Other Land converted to Forest Land	148,574

Cropland converted to Forest Land	1,254,598
Wetlands converted to Forest Land	42,242
Grassland converted to Forest Land	1,993,420
Settlements converted to Forest Land	1852

4.10.6.3 Cropland

Croplands refer mainly to crop fields on which annual and perennial crops are cultivated and to temporary fallow land. Ethiopian cropland production systems consist of cereals, pulses, oilseeds, vegetables, root crops and fruit crops. Cropland comprised emissions and removals from cropland remaining cropland, forest land converted to cropland, grassland converted to cropland, settlements converted to cropland, wetlands converted to cropland and other land converted to cropland.

Methodological Issues

In this inventory, the IPCC Gain and Loss Method (Equation 2.4, page 2.9, Vol 4, IPCC 2006 Guidelines) was used to produce estimates for croplands (annual and perennial) and calculations were performed using the IPCC Inventory software (Version 2.69). Gain-Loss Method (Tier 1) was used to estimate cropland remaining annual cropland and land converted to cropland.

Above- and below-ground biomass

For annual crops, an increase in biomass stocks in a single year is assumed to be equal to biomass losses from harvest and mortality in that same year (IPCC 2006).

Dead organic matter

According to the Tier 1 method there is no need to estimate the carbon stock changes for DOM.

Mineral and organic soils

Currently, there is no specific data on management systems in the country to apply reference carbon stocks and stock change factors. Emissions from organic soil are not estimated (2006 IPCC equations: Vol. 4., Ch. 2: 2.24/2.25/).

Land Converted to Cropland

Above- and below-ground biomass

Changes in biomass carbon stocks have been estimated according to Tier 1 with activity data disaggregated between annual and perennial crops. Conversions from all other land uses (e.g., from forest land, grassland etc.) to cropland occur in the country. The principle of estimating the CSC in biomass in land converted to cropland assumes that biomass loss is accounted only for the year of conversion, thus ΔC conversion must be multiplied by annual area (i.e., area in the year of conversion). Reference to 2006 IPCC equations: Vol. 4., Ch. 2: 2.15/2.16.

Dead organic matter

A Tier 1 method considers the estimation of CSC in dead organic matter only for major conversion categories (e.g., forest land to cropland). It is assumed that all dead organic matter is removed in the year of conversion, so there is no accumulation in land converted to cropland afterwards (2006 IPCC equation: Vol. 4., Ch. 2: 2.23).

Emissions and Removals

Emissions from cropland were estimated to be 87,984 Gg CO_2eq. in 2020. Cropland was the third largest source of net CO_2 emission (28.57%) in the land category. Forestland to cropland conversion was the biggest contributor of all the conversion categories as indicated in Table 4-21 below.

Table 4-21: Total Area Conversions from cropland subcategory (ha)

Activity	Area (ha) in 2020
Total area of Cropland	29,343,398
Annual Cropland Remaining Annual Cropland	23,324,292
Perennial Cropland Remaining Perennial Cropland	46,143
Land Converted to Annual Cropland	5,925,552
Land Converted to Perennial Cropland	47,408
Forest Land converted to Annual Cropland	1,719,674
Forest Land converted to Perennial Cropland	9,140
Other Land converted to Annual Cropland	478,244
Other Land converted to Perennial Cropland	18,570
Wetland converted to Annual Cropland	108,780

wetland converted to Perennial Cropland	752
Grassland converted to Annual Cropland	3,611,698
Grassland converted to Perennial Cropland	18,924
Settlement converted to Annual Cropland	7,156
Settlement converted to Perennial Cropland	22

4.10.6.4 Grassland

Grassland comprises all the land that is dominated by grass cover and includes rangelands and pastureland that are not considered as cropland or forestland. The grassland category predominantly comprises montane grassland that has vegetation dominated by perennial grasses and grazing or pasture are predominant. Grassland comprised emissions and removals from grassland remaining cropland, forestland converted to grassland, cropland converted to grassland, settlements converted to grassland, wetlands converted to grassland and other land converted to grassland. The Ethiopian grasslands are extensively managed rangelands such as private grazing land used by smallholder farmers and ranch and savannahs where animal (both wild and domestic) stocking rates and fire regimes are the main management variables (Mosisa et al., 2021).

Methodological Issues

In this inventory, the IPCC Gain and Loss Method (Equation 2.4, page 2.9, Vol 4, IPCC 2006 Guidelines) was used to produce estimates for grassland and calculations were performed using the IPCC Inventory software (Version 2.69). Gain-Loss Method (Tier 1) was used to estimate grassland remaining annual grassland and land converted to grassland. For land converted to Grassland, Equation 2.16 was computed for both herbaceous biomass and woody biomass since each of these components has a different carbon fraction. The EF used for grassland was the IPCC default for a Subtropical Steppe. Gain-Loss Method (Tier 1) was used to estimate grassland remaining grassland and land converted to grassland.

Above- and below-ground biomass

- For annual grassland increase in biomass stocks in a single year is assumed equal to biomass losses from harvest and mortality in that same year (IPCC 2006).

Dead organic matter

- According to the Tier 1 method, by estimating the area of each type of land conversion using only the major conversion categories such as Forest Land to Grassland.

Mineral and organic soils

- Currently, there is no specific data on management systems in the country to apply reference carbon stocks and stock change factors. Emissions from organic soil are not estimated.

Source: 2006 IPCC equations: Vol. 4., Ch. 2: 2.24 / 2.25 /)

Land Converted to Grassland

Above- and below-ground biomass

Changes in biomass carbon stocks have been estimated according to Tier 1. Conversions from all other land uses (e.g., from forest land) to grassland occur in the country. The principle of estimating the CSC in biomass in land converted to grassland assumes that biomass loss is accounted only for the year of conversion, thus ΔC conversion must be multiplied by annual area (i.e., area in the year of conversion) (2006 IPCC equations: Vol. 4., Ch. 2: 2.15 / 2.16).

Dead organic matter

- A Tier 1 method considers the estimation of CSC in dead organic matter only for major conversion categories (e.g., forest land to grassland). It is assumed that all dead organic matter is removed in the year of conversion, so there is no accumulation in land converted to grassland afterwards (2006 IPCC equation: Vol. 4., Ch. 2: 2.23). See also Method Statement for Grassland land (GL) – MS 4 for detailed information on estimation methods on grassland.

Emissions and Removals

GHG emissions associated with management practices such as burning are reported in this inventory, but they occur. In 2014 emissions from grassland were at 92,127 Gg CO_2e in 2020 (Table 24: Total Area Conversions from grassland subcategory). Grassland was the second largest source of net CO_2 emission (29.91%) in the land category. Grassland remaining grassland and land converted to grassland is shown in Table 4-22 below.

Table 4-22: Total Area Conversions from grassland subcategory (ha)

Activity	Area (ha) in 2020
Total Area of Grassland	53,077,078
Grassland Remaining Grassland	41,985,396
Land Converted to Grassland	11,091,682
-Forest Land converted to Grassland	1,585,104
- Other Land converted to Grassland	1,699,598
- Cropland converted to Grassland	7,454,044
- Wetlands converted to Grassland	349,038
- Settlements converted to Grassland	3,898

4.10.6.5 Wetland

This category comprised emissions and removals from wetlands remaining wetlands and all land converted to wetlands. In accordance with IPCC guidance, wetlands remaining wetlands estimates include N_2O emissions from wetlands and net CO_2 emissions from removal of wetland vegetation in addition to other vegetation-related sources of emissions and removals. However, for this inventory, only flooded lands are reported. Flooded lands include reservoirs or impoundments which are predominantly used for irrigation and, to a lesser extent, energy production and recreation. Data on peatlands are very scarce in the country, no data included.

Methodological Issues

In this inventory, the IPCC Stock Change Equation 7.10, page 7.20, Vol 4, IPCC 2006 Guidelines was used to estimate emissions from CO_2 in lands converted to flooded land and calculations were performed using the IPCC Inventory software (Version 2.69). Stock Change Method (Tier 1) was used to estimate land converted to wetlands. At present, the notation key NE has been used for peat extraction. When more detailed data on peat extraction are available, an IPCC default methodology can be applied (2006 IPCC equation: Vol. 4., Ch. 7: 7.10). Wetland remaining wetland and land converted to wetland is shown in Table 4-23.

Emissions and Removals

In both inventory year 2018 and 2020, emissions from wetland were estimated to be 719 Gg CO_2eq.

Table 4-23: Total Area Conversions from wetland subcategory (ha)

Activity	Area (ha) in 2020
Total Area of Wetland	1,429,122
Wetland Remaining Wetland	1,077,928
Land Converted to Wetland	351,194
-Forest Land converted to Wetland	45,948
- Other land converted to Wetland	46,644
- Cropland converted to Wetland	199,568
- Grassland converted to Wetland	58,984
- Settlements converted to Wetland	48

4.10.6.6 Settlements

Settlements comprise emissions and removals from settlements remaining settlements, forest land converted to settlements and wetlands converted to settlements. Settlements include rural settlements, infrastructure and urban areas that are detectable from satellite imagery. However, it should be noted that the settlements may have been underestimated due to the fact that rural homesteads are typically surrounded by and interspersed within cropland and other vegetation, thereby increasing the probability of their spectral signature being missed by satellite imagery.

Methodological Issues

In this inventory, the IPCC Gain and Loss Equation 2.7, IPCC 2006 Guidelines was used to produce estimates for changes in carbon stocks for settlements and calculations were performed using the IPCC Inventory software (Version 2.69). Activity data were derived through wall-to-wall supervised classification of Landsat imagery covering the years 2018 and 2020. This means that GIS-based settlement maps for the years 2018 and 2020 were produced from wall-to-wall remote sensing and ground-truthing. Estimation methods based on IPCC 2006, Vol4, Ch8. All carbon pools in settlements remaining settlements (SL-SL) are assumed to be not changing thus reported as NO. Tier 1 assumes no change in carbon stocks in live biomass in settlements remaining settlements, in other words, it is the growth and loss terms balance. Thus, the carbon stock change in settlements remaining settlements has not been estimated. Land converted to settlements estimation shows an increasing trend. The major driver of the emissions has been conversions from other land uses that result in loss of carbon. Settlements remaining settlements and land converted to settlements are shown in Table 4-24.

Land converted to Settlements

Above- and below-ground biomass

Country specific values for biomass stocks present on land.

• Changes in biomass carbon stocks have been estimated according to Tier 1. Conversions from all the other land uses to settlements occur in the country. The principle of estimating the CSC in biomass in land converted to settlements assumes that biomass loss is accounted only for the year of conversion, thus ΔC conversion must be multiplied by annual area (i.e., area in the year of conversion) (2006 IPCC equations: Vol. 4., Ch. 2: 2.15 / 2.16).

Dead organic matter

• A Tier 1 method considers the estimation of CSC in dead organic matter only for major conversion categories (e.g., forest land to settlements). It is assumed that all dead organic matter is removed in the year of conversion, so there is no accumulation in land converted to settlements afterwards (2006 IPCC equation: Vol. 4., Ch. 2: 2.23).

Change in soil organic C stocks can be estimated for mineral soils with land-use conversion to settlements using Equation 2.25 in Chapter 2 using a tier 1 method.

Emissions and Removals

Emissions from settlements were estimated to be about 45 Gg CO_2e in the year 2020. The conversion of forestland (especially indigenous forest) to settlements and, to a lesser extent, the grassland to settlements were significant contributors to the settlement's category. This is driven by the expanding human population and urbanization.

Table 4-24: Total area conversions from settlements subcategory (ha)

Activity	Area (ha) in 2020
Total Area of Settlements	332,966
Settlements Remaining Settlements	146,816
Land Converted to Settlements	186,150
-Forest Land converted to Settlements	24,032
- Other Land converted to Settlements	8,474
- Cropland converted to Settlements	94,972

- Wetlands converted to Settlements	1952
- Grassland converted to Settlements	56,722

4.10.6.7 Other Land

This category includes bare soil/erosion, rocks and all land areas that are not part of any of the other five land-use categories. The other land category is the smallest land in terms of size comprising an average of 0.1% of the total land area. Other land emissions and removals comprise those from other land remaining other land, forest land converted to other land, cropland converted to other land, and wetlands converted to other land.

Methodological Issues

In this inventory, the IPCC Gain and Loss Method (Equation 2.4, page 2.9, Vol 4, IPCC 2006 Guidelines) was used to produce estimates for settlements and calculations were performed using the IPCC Inventory software (Version 2.69). Another land category is a net emission due to lands converted to other land. Other land remaining other land and land converted to other land is shown in Table 4-25.

Land converted to other land

Above- and below-ground biomass

Changes in biomass carbon stocks have been estimated according to Tier 1. Conversions from all other land uses (e.g., from forest land) to other land occur in the country. The principle of estimating the change in biomass in land converted to other land assumes that biomass loss is accounted only for the year of conversion, thus change in carbon conversion must be multiplied by annual area (i.e., area in the year of conversion) (2006 IPCC equations: Vol. 4., Ch. 2: 2.15 / 2.16).

Dead organic matter

•A Tier 1 method considers the estimation of CSC in dead organic matter only for major conversion categories (e.g., forest land to other land). It is assumed that all the dead organic matter is removed in the year of conversion, so there is no accumulation in land converted to other land (2006 IPCC equation: Vol. 4., Ch. 2: 2.23).

Change in soil organic C stocks can be estimated for mineral soils with land-use conversion to settlements using Equation 2.25 in Chapter 2 using a tier 1 method.

Emissions and Removals

The conversion of forest land (especially indigenous forest) to other land and grassland to other land were significant contributors to this category where emissions are estimated to be 3,045Gg CO_2eq. in 2020. This is driven by the expanding human population and urbanization.

Table 4-25: Total Area Conversions from other land subcategory (ha)

Activity	Area (ha) in 2020
Total Area of Other Land	12,094,960
Other Land Remaining Other Land	10,076,749
Land Converted to Other Land	2,018,210
-Forest Land converted to Other Land	97,924
- Cropland converted to Other Land	266,760
- Wetlands converted to Other Land	11,746
- Grassland converted to Other Land	1,641,718
- Settlements converted to Other Land	64

4.11 Waste Sector

GHG emissions from the waste sector result largely from disposal of solid wastes through landfilling, dumping, incineration, open burning and treatment of domestic and industrial liquid wastes. The emissions from solid waste are predominantly CH_4 and CO_2 from disposal sites. Wastewater can also be a source of methane (CH_4) and nitrous oxide (N_2O) when treated or disposed of anaerobically. The IPCC 2006 Guidelines divide the waste sector into the following source categories: Solid Waste Disposal (4A), Biological Treatment of Solid Waste (4B), Incineration and Open Burning (4C) and Wastewater Treatment and Discharge (4D). Each source category is further divided into subcategories that take into account different waste attributes, management practices and approaches.

In 2020, the total GHG emissions from the Waste Sector were 9,303.30 Gg CO2 eq, The sector constituted 3.55 % of the total national greenhouse gas emissions of 2020 year.

As we can see from Figure 4-13 the emission from the waste sector was mainly from the biological treatment (57.51%) and followed by wastewater treatment and discharge (38.35%), solid waste disposal and incineration and open burning (4.11%) for the sector.

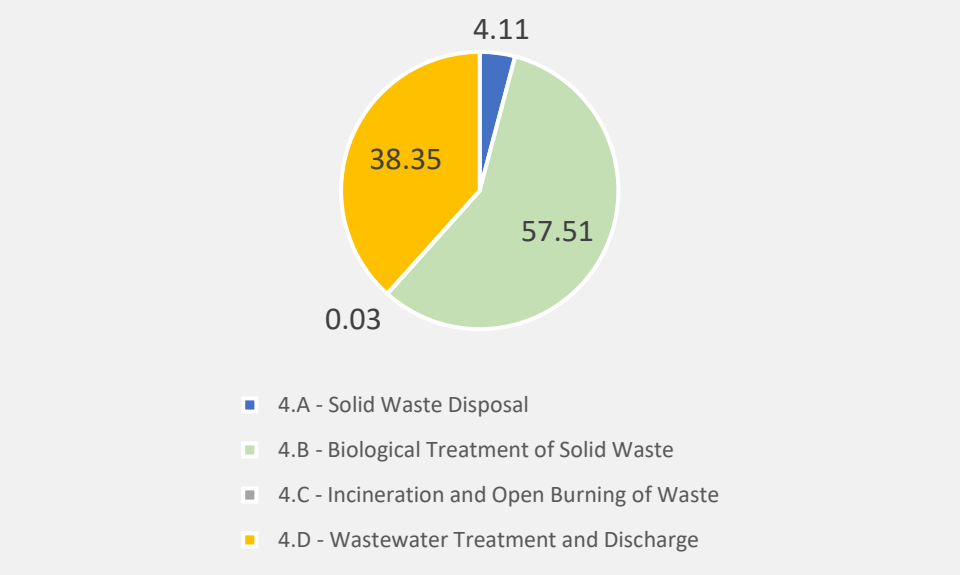


Figure 4-13: Share of sectors from the emission of GHG from the waste sector

Methodological Issues

Tie 1 methodology of IPCC 2006 was used to estimate emissions from waste management. Population data from Ethiopia Statistics Services were collected to estimate emission from SWDS. In 2018, emissions from wastewater handling represented 4,656.82 Gg CO2-eq of the total waste sector emissions and increased 9,303.30 Gg CO2-eq in 2020.

4.11.1.1 Solid Waste Disposal

Treatment and disposal of municipal, industrial and other solid waste produce significant amounts of methane (CH_4). Emissions related to the disposal of municipal and industrial waste on solid waste disposal sites (SWDSs) are contained within efforts have been made in order to collect the necessary data and information on organic industrial waste (including biodegradable industrial waste and sludge from wastewater treatment) disposed on SWDSs.

Methodological Issues

Data from the Ethiopia Central Statistics Agency were used to estimate the amount of Municipal Solid Waste generated. The national population for the year 2000 and 2007 was obtained from the second and third national census reports and the trend was calculated based on the estimated population growth rate (2018 – 2020) (Table 4-26: National Population Data and National GDP, (2018-2020). In addition, national GDP was used to estimate the amount of industrial waste generated in the country. A method used to calculate CH_4 emissions according to 2006 IPCC Guidelines is First Order Decay (FOD) method. The quantity of disposed municipal solid waste and industrial waste is taken into account from the year 2018 onwards. Regarding Methane Conversion factor (MCF), due to the absence of country specific data, default values were used from the 2006 IPCC Guideline (Table 3.1), which are 0.4 and 0.6 for Unmanaged-Shallow (<5m waste) and Uncategorized SWDS respectively.

Table 4-26: National Population Data and National GDP, (2018-2020) Source: Ethiopia Statistics Services Population); and Ministry of Plan and Development (GDP)

Year	Population, Million	GDP (USD Millions)
2018	19.164	84269
2019	19.7337	87239.67
2020	20.446	92989.00

Furthermore, the composition of MSW was computed using the default value from the 2006 IPCC Guideline in Table 4-27.

Table 4-27: Composition of MSW (in %) Source – 2006 IPCC Guideline Emissions

Waste Type	Default value	Source
Food Waste	53.9%	IPCC 2014 Vol. 5 Chapter 2, Table 2.3 of Page 2.12
Garden Waste	0.0%	
Paper	7.7%	
Wood and Straw	7.0%	
Textiles	1.7%	
Disposable Nappies	0.0%	
Rubber, Leather, Plastic, Metal, Glass & other Inert	29.7%	
Total	100%	

5 MITIGATION ACTIONS AND THEIR EFFECT

5.1 General Overview

Ethiopia has made efforts to comply with UNFCCC requirements by formulating and promoting the implementation of mitigation actions, subject to the availability of financial and human resources. To facilitate the implementation of mitigation and adaptation measures, Ethiopia established the CRGE strategy in 2011, outlining its vision to become a middle-income country through a green economy. Subsequently, important milestones were achieved when the country submitted its Intended Nationally Determined Contribution (INDC) in 2015, which automatically became a Nationally Determined Contribution (NDC) with the coming into effect of the Paris Agreement in 2016. These steps set the direction for Ethiopia's climate change mitigation efforts.

In addition, Ethiopia conducted detailed mitigation analysis and assessment of options to reduce greenhouse gas emissions and enhance sinks in its Second National Communication (SNC) and third National Communication. These documents emphasize the need for support to meet national obligations and international commitments. More recently, in 2021, Ethiopia submitted an updated NDC in line with the Paris Agreement, which includes specific mitigation commitments to be achieved through national and internationally supported actions. The country aims for a more ambitious 68.8% emission reduction target by 2030, surpassing its initial NDC goal of 64%, resulting in a reduction of 277.7 compared to business-as-usual (BAU) projections.

The preparation of the FBUR (First Biennial Update Report) was informed by a stock take of various forms of mitigation actions. These actions encompass both climate-focused and development-focused measures. Ethiopia has also implemented policies, strategies, and programs to create a favorable environment for low-carbon and climate-resilient economic development, striving to address the impacts of climate changein the country.

5.2 Key Government Policies and Measures that Impact Climate Change Mitigation

Ethiopia has mainstreamed and integrated climate change issues in its development plans and has implemented numerous mitigation measures in various economic sectors to curb emissions. The National CRGE has laid out the detailed guidelines and framework outlining the sectors strategies and priority

actions to climate change adaptation and mitigations and their contributions to the nationally determined targets. The Ethiopian policy road map for the implementation of CRGE/NDC is indicated in Figure 5-1.

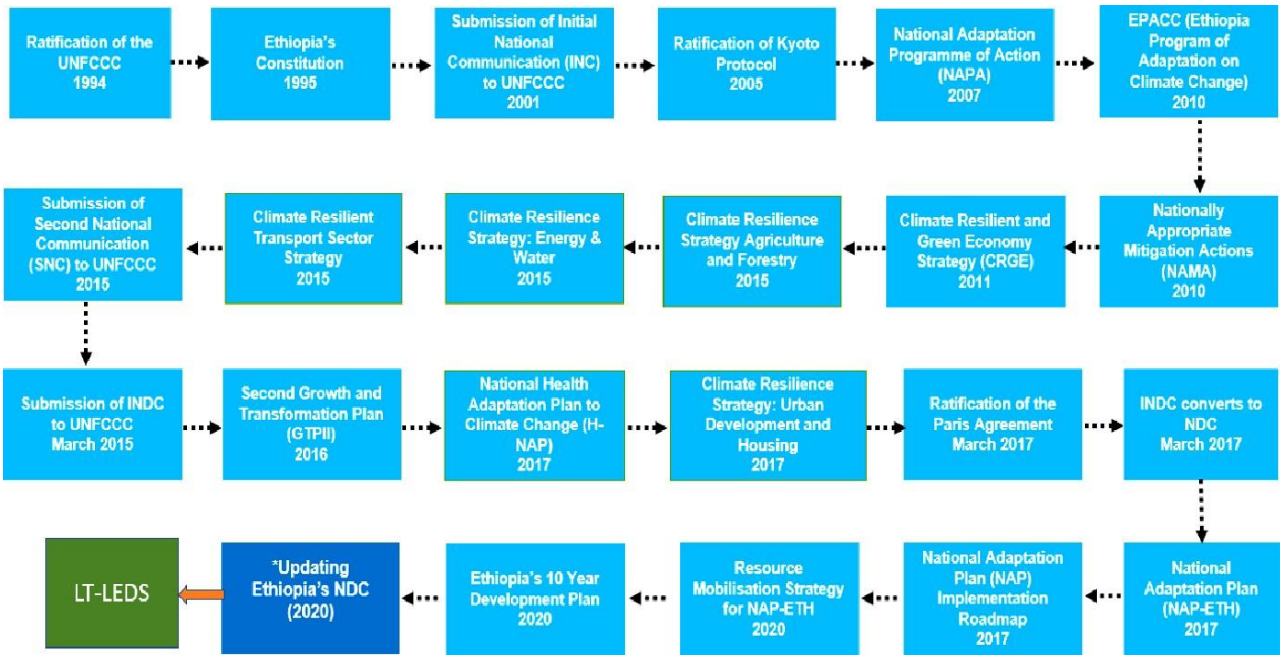


Figure 5-1: Ethiopian climate change policy roadmap since 1994

Key policy interventions where mitigation potential have been identified and which addressed the NDC are given in Table 5-1 below.

Table 5-1: Key mitigation Police interventions in NDC

Sector	Policy Interventions
AFOLU	• Sustainable agriculture • Agriculture mechanization • Afforestation/Reforestation 3 million ha of land by 2030 (conditional pathway) • Restoration of 5 million ha of land by 2030 (conditional pathway) • Reducing deforestation and forest degradation by 50%
ENERGY	• Renewable energy development • Energy efficiency • Transport electrification • Public transportation • Industry fuel switches

IPPU	• Clinker substitution
Waste	• Reducing emissions from reduced waste generation rate per capita • Reducing emissions by aggressively diverting organic materials from landfills, i.e., waste separation and composting • Reducing emissions from reduced wastewater

Updated Business-as Usual Unconditional, and Conditional Element

The base year and BAU emission projections of the updated NDC differ from the 1st NDC because of differences in the methods of estimation and the updated data used compared to the first NDC (Figure 5-2). In this regard, the updated base year emissions in 2010 are estimated at 247 Gg of carbon dioxide equivalents (Gg CO_2e) which are projected to increase to a level of 403.5 Mt CO_2e in the BAU scenario in 2030. The projections are further divided into three pathways, i.e., unconditional, conditional and BAU. The unconditional pathway will result in absolute emission levels of 347.3 Gg CO_2e in 2030, which represents a reduction against the revised BAU of 14% (-56 Gg CO_2e) in 2030.

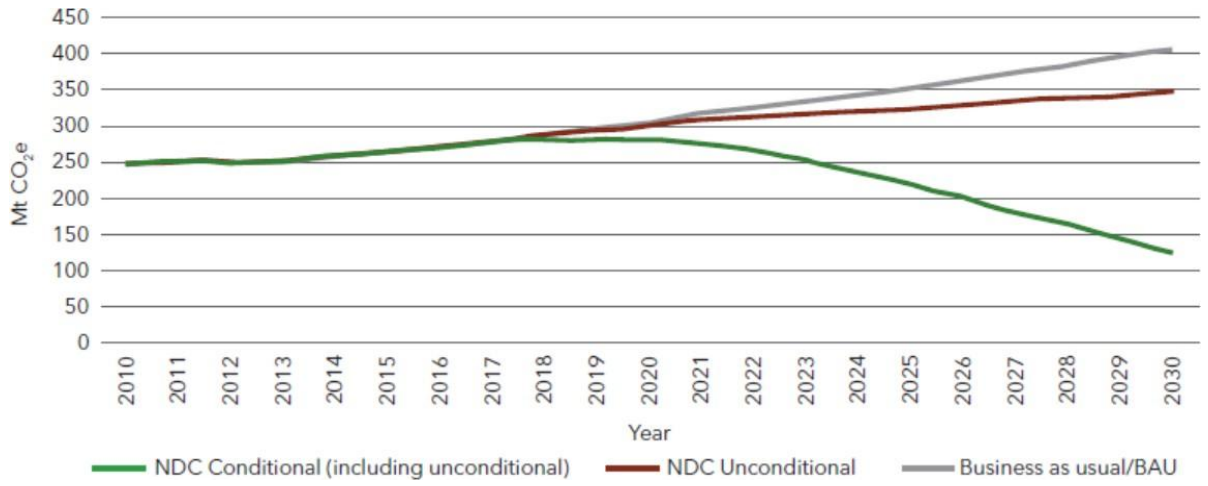


Figure 5-2: NDC Conditional" represents the combined impact of unconditional and conditional elements. (Source Updated NDC)

The list of tables below (Table 5-2 to Table 5-5) classifies the policies and measures in terms of the four IPCC reporting categories: Agriculture, Forestry and Land Use; Energy; Industrial Processes and Product Use: and Waste.

Table 5-2: AFOLU mitigation actions and its effects

Name of the action	Policy/Instrument Aligned	Primary purpose	GHG	Status	Implementing Entity	Progress indicator	Steps Taken/Envisaged	Estimated Emission Reduction	Co-Benefits
National Forest Sector Development Program, Ethiopia	-CRGE strategy -REDD+ Programme	To build on Ethiopia's existing forest resources, attracts foreign investment and seeks to transform the sector to catalyse GDP growth, employment, promote alternative use of energy sources, environmental protection and sustainable use of forest products	CO_2	in force since …	-Environment Forest Climate Change Commission -Ministry of Finance -Planning and Development Commission	Area planted and maintained (ha), Annual Investment cost ($) Jobs created (No)	-Increasing forest cover from currently 15.7% to 20% by 2020 and 30% by 2025; and -Increasing annual benefits from improved land use by the equivalent of 8% of GDP by 2025. -Achieving 50% of the national emission reduction target	Not estimated	create 633,141 full time jobs,
REDD+ Programme	- CRGE Strategy	to reduce GHG emissions and expand the forest area that	CO_2	on going	-Environment Forest Climate	- Programme delivery	-National REDD+ Strategy	130 million tons CO_2 e in 2030	Promotion of livelihood

		can absorb carbon by implementing policies and actions that target to address not only forest emission from deforestation and forest degradation, but carbon removals through large scale forest restoration			Change Commission	indicators (%), -Area of land of which carbon stock are enhanced (ha) -Investment ($)	-REDD+ Investment Program, -Ethiopia REDD+ Readiness Package(R-Package) -Supporting Sustainable Forest Management through REDD+		

The consumption of gasoline by cars in Ethiopia has exhibited a fluctuating trend over the years. From 1996 to 2002, gasoline consumption increased significantly from 4,309 TJ to 8,222 TJ, reaching its peak in 2002. This suggests a rise in private car ownership during that period. However, starting from 2003, gasoline consumption began to decline and reached 7,123 TJ in 2018. This decline can be attributed to the introduction of various public transportation options such as light rail transits, meter taxis, school buses, double-deck buses, and new Euro 111 buses (Kassahun, 2018). The shift towards increased public transportation usage and a decrease in private car ownership contributed to this downward trend in gasoline consumption. As a result, the consumption of gasoline by cars remained relatively stable for almost 10 years, from 2009 to 2020.

Table 5-3: Energy and transport sector mitigation actions and its effects

Name of the action	Policy/Instrument Aligned	Primary purpose	GHG	Status	Implementing Entity	Progress indicator	Steps Taken/Envisaged	Estimated Emission Reduction	Co-Benefits

National Energy Policy	-CRGE strategy	·Improve the security and reliability of energy supply and be a regional hub for renewable energy. · Increase access to affordable modern energy. · Promote efficient, cleaner, and appropriate energy technologies and conservation measure.	CO_2	on going	-Ministry of Water, Irrigation and Energy	National Electrification Program 1 and 2 has been formulated	increasing access to modern, affordable energy through on- and off-grid solutions, and encouraging energy cooperatives and societies as well as the private sector to participate in energy service delivery	Not estimated	Security of energy supply Cost competitiveness and environmental protection Increase investment in the Renewable energy
National Electrification Program	- CRGE Strategy -National Energy Policy	action plan for achieving universal electricity access nationwide by 2025, in a strategic and comprehensive as well as	CO_2	on going	-Ministry of Water Irrigation and Energy	• 12 pilot solar mini grids contract signed and under implementation, • 25 additional solar mini grids	By 2025, 65 percent of access provision is targeted with grid solutions and 35 percent with off-grid technologies (solar off-grid	Not estimated	Energy Security Promotion of livelihoods

		efficient and transparent manner, for the benefit of all its citizens				(financed by AfDB and GoE) under design and • 250 solar mini grids solar under feasibility study stage	and mini-grids).		
National Improved Cookstove Program (NICSP)	- CRGE Strategy - National Electrification Program	to increase Ethiopia's biomass, use efficiency through the distribution of fuel-efficient cookstoves.	CO_2	on going	-Ministry of Water Irrigation and Energy	No of improved cookstoves disseminated No of job created	distributed almost 9 million improved cookstoves 2011-2015 and to disseminate 31 million stoves before 2030	Not estimated	environmental protection, job creation improvement of household health well being
National Biogas Programme of Ethiopia, Phase II (NBPE-II)	National Energy Policy	To support Government of Ethiopia's efforts in developing a commercially viable, market-oriented biogas sector for reducing	CO_2	completed	-Ministry of Water Irrigation and Energy - Netherlands Development Organization (SNV)	No of households planted	18,534 high quality biogas plants constructed	Not estimated	Raise standard of living, in rural areas,

		carbon emissions and creating access to efficient domestic energy.							Reduce environment degradation
Electricity Network Rehabilitation and Enhancement Project (ENREP)	- National Electrification Program	to enable further delivery of electricity services in the country through expanding access in on and off grid areas. The project had 4 components, of which, component 3 was 'Market development for renewable energy and energy efficient product'.	CO_2	2013-2019	-Ministry of Water Irrigation and Energy funded by World bank	No of households with access to modern energy services No of solar lanterns sold	• More than one million households were positively affected by increasing access to modern energy services. • 1,051,691 solar lanterns and solar home systems were procured.	-certified amount of 38,913 tCO_2e for a total of 417,615 solar lamps distributed - certified amount of 35,465 t CO_2e for a total of 4,812 domestic biogas plants	Investment in renewable energy technology Diversification of energy mix Reduce GHG emissions
FDRE Renewable energy projects	-National Energy Policy	Large scale hydropower development -Grand Ethiopian	CO_2	On going	-Ministry of Water Irrigation and Energy	Electricity availability on national grid (MWh)	Gilgel Gibe III Dam project completed on 2016 and Genale-Dawa III	Not estimated	Better standard of living of population, better health through

		Renaissance GERD Dam Project, -Gilgel Gibe III Dam, - Genale-Dawa III multipurpose hydropower					multipurpose hydropower completions in 2020		improved environmental quality, job creation
FDRE Renewable energy projects	-National Energy Policy	Geothermal Power Development with committed and planned prospects -Tendaho-3 (Allalobeda) -Corbetti -Aluto 1(Aluto-Langano) -Tendaho 1(Dubti)	CO_2	On going	-Ministry of Water Irrigation and Energy with help of different donors	Electricity availability from renewables on national grid (MWh)	two geothermal power production projects underway (Tulu Moye & Corbetti)	Not estimated	-Energy Security -Energy Mix -Reliable Electrical Supply -Greenhouse Gas Mitigation

ETHIOPIA NON-MOTORISED TRANSPORT STRATEGY 2020-2029	-CRGE Strategy	provide safe, efficient, and accessible walking and cycling networks to improve mobility for all residents, enhance access to opportunities, and facilitate inclusive urbanization.	CO_2	On going	Ministry of Transport	Vehicle kilometres travelled by Personal Motor Vehicles Investments in high-quality walking and cycling facilities	Public transport and paratransit constitute 80% of all motorized trips • Modal share of Non-Motorized Transport remains at or above 60% of trips	Not estimated	Better air quality high-quality walking and cycling facilities
Addis Light Rail Transit Project	-CRGE Strategy	Provide an alternative means of public transport to the city's road-based system. Speed up passenger journey times. To provide a more environmental	CO_2	On going	Ministry of Transport	Jobs created No of travellers	serving up to 60,000 passengers across four lines, every hour	1.8 million t CO_2e by 2030	Job creation GHG emission

		ly friendly transport option.							
Ethiopia-Djibouti Railway	Transport Master Plan for Addis Ababa	Cross-border electrified railway development to provide freight and passenger transport services	CO_2	On going	Ministry of Transport Ethiopian Railway Corporation (ERC) and the Société Djiboutienne de Chemin de Fer (SDCF) Ethio-Djibouti Standard Gauge Railway Company (EDR)	No of passengers No of freights transport	753 km electrified single-track standard gauge line between Ethiopia's capital Addis Ababa and the Port of Djibouti, with 45 stations in total	saved 639 tons of emissions from passenger transport and 790 tons of emissions in freight transport in 2017	competitive railway service supports port and transit cargo operations source of income international trade corridor
Addis Ababa's first Bus Rapid Transit (BRT)	Transport Master Plan for Addis Ababa	Urban transport and effective mass transit network development.	CO_2	On going	Ministry of Transport Addis Ababa	Passenger travel on BRT Bus (%)	construction of a 16 km-long bus lane (with 12 km on a BRT line).	Not estimated	GHG emission reduction

		- The bus line is expected to have a capacity of 5,400 passengers per hour in each direction and to reach more than 400,000 residents			Road and Transport Bureau,				Increased public transportation

Table 5-4: IPPU sector mitigation actions and its effects

Name of the action	Policy/Instrument Aligned	Primary purpose	GHG	Status	Implementing Entity	Progress indicator	Steps Taken/Envisaged	Estimated Emission Reduction	Co-Benefits

Clinker substitution & Fuel Energy switch	-CRGE strategy	Improved energy efficiency, energy management and reduction of fossil fuels in cement industry	CO_2	on going	Ministry of Industry	MT CO_2e emission in the cement production	In 2019/20[1] - The clinker in PPC was reduced from average 78% to 70% while that of OPC remained at 93%. - about 250% of the targeted reduction achieved.	Less than or equal to 5.32 MT CO_2e (2022)	

Table 5-5: Waste sector mitigation actions and their effects

Name of the action	Policy/Instrument Aligned	Primary purpose	GHG	Status	Implementing Entity	Progress indicator	Steps Taken/Envisaged	Estimated Emission Reduction	Co-Benefits
Creating Opportunities for Municipalities	-CRGE strategy	promote greater use of Integrated Solid Waste	CO_2 CH_4	on going	Ministry of Urban and infrastructure Development	Cumulative weight of organic waste	deliver direct annual emission reductions from UGI initiatives	Not estimated	Job creation

1

to Produce and Operationalize Solid Waste Transformation COMPOST		Management (ISWM) and Urban Green Infrastructure (UGI) approaches in Ethiopian cities and towns			and Construction.	diverted from landfills for composting, tones Reforest ha of degraded land in the cities Number of operational composting plants number of direct jobs created	and ISWM equal to approximately 306,000 and 132,321 tCO_2e, respectively. These will accrue from the annual generation of 45,489 tons of compost from 151,629 tons of household organic waste, and the reforestation of 33, 309 ha of degraded land by the end of the project lifetime.		increased resilience of urban areas to drought and flooding hazards, and improved quality of life in urban areas.

5.3 International Market Mechanism

Under the UNFCCC, Ethiopia participated in the Clean Development Mechanism and Voluntary Carbon Market. However, the GHG emissions reduction from the market mechanism highlighted in this section is indicated below being not accounted for as part of the national mitigation actions.

5.3.1 Clean Development Mechanism (CDM)

Following Ethiopia's ratification of the Kyoto protocol on 21 February 2005 as a non-Annex I Party in the Doha Amendment to the Protocol, Ethiopia has developed different national strategies that include both short- and long-term perspectives of the country's position regarding climate change mitigation measures. Ethiopia is one of the most active countries in the international market mechanism through the Kyoto Protocol's CDM. Participation of Ethiopia started with the implementation of the Kyoto Protocol's Clean Development Mechanism (CDM). Currently, Ethiopia has 9 registered CDM activities: 2 projects (methane avoidance, municipal waste) and 7 Programme of activities (PoAs) (5 improved cook stoves, 1 biomass and 1 solar program) with a total of 16 component project activities (CPAs) (see Table 5-6 and Table 5-7). The projects have the total volume of 1009 kCERs per year. In addition, the country has issued Letters of Approval for 10 PoAs in total. Four PoAs have successfully issued over 750,000 CERs, whilst one additional project, which has since de-registered from the CDM, previously issued over 250,000 CERs.

Table 5-6: Standalone CDM project in Ethiopia Source: UNFCCC CDM database

Project title	Sector	Coordinating Entity	Methodologies / Assumptions	GHG emission reduction	Project duration/Crediting period
Humbo Ethiopia Assisted Natural Regeneration Project	Reforestation	JACO CDM CO., LTD	AR-AM0003[2] ver. 4	29,343 metric tonnes CO_2 equivalent per annum	01 Dec 06 - 30 Nov 36 (Fixed)
Methane Capture and Flaring from	Waste (Landfill	RWTÜV GmbH	ACM0001	96,884 metric tonnes CO_2	01 Jun 2013 – 31 May 2023 (Fixed)

2

Addis Ababa Repi open dump fill	Gas-Landfill flaring)			equivalent per annum	
HG Emissions Reduction through Modjo Common Effluent Treatment Plant	Waste (Methane Avoidance-Waste water)	ERM Certification and Verification Services Limited (ERM CVS)	AM0080	64,998 metric tonnes CO_2 equivalent per annum	01 Jan 2019 – 31 Dec 2028 (Fixed)

Table 5-7: List of CDM Programme of the country is participating. Source: EPA and UNFCCC database for POA and PA

Project Title	Coordinating Entity	Sector	Number of CPAs	Methodology	PoA Duration/ CPAs Crediting period	Amount Reduction (Kt CO_2e/yr)
PoA for the Reduction of emission from non-renewable fuel from cooking at household level	Green Development AS	Energy Stoves-methane avoidance - domestic manure	63 (4 in Ethiopia)	AMS-I.E.,	01 Oct 2012 - 30 Sep 2040	63,934
Energy Efficient Stoves Program (EESP)	World Vision	Energy Stoves	3	AMS-II.G.	05 Sep 12 - 04 Sep 40	139,588
Paradigm Sub Saharan Africa Cook Stove Programme	The Paradigm Project (TPP)	Energy Stoves	1	AMS-II.G.	30 Oct 2012 - 29 Oct 2040	64,998
Fuel Efficient Stoves for Ethiopia Programme of Activity	World Food Programme	Energy Stoves	1	AMS-II.G.	18 Sep 2013 - 17 Sep 2041	43,097
Ethiopia – Clean Cooking Energy Program	Development Bank of Ethiopia (DBE)	Energy (Biogas)	2	AMS-I.I.+AMS-I.E., +AMS-II.G.	23 Dec 2014 - 22 Dec 2042	93,804

Ethiopia Off-Grid Renewable Energy Program	Development Bank of Ethiopia (DBE)	Energy Off-grid RE technologies Solar lamps	3	AMS-III.AR. +AMS-I.F.+AMS-I.L.+AMS-I.B.	23 Dec 2014 - 22 Dec 2042	63,290
Project Gaia Cook Stove Programme of Activities (PoA)	Project Gaia Inc.	Energy Stoves	2	AMS-I.I.+AMS.I.E.,	12 Feb 15 - 11 Feb 43	67,781

5.3.2 Voluntary Carbon Market (VCM) standards

In total, over 1.6million carbon credits have been issued in Ethiopia from the Clean Development Mechanism (CDM) and the Voluntary Carbon Market (VCM) standards. Ethiopia has 29 registered VCM activities that have issued close to 600,000 emission reductions. The VCM activities have also focused on improved cookstoves, though in addition have expanded the Ethiopian carbon market portfolio through a strong focus on forestry and water projects that were not supported by the CDM. The list of registered Voluntary Carbon Standard activities is as follows:

a) Gold Standard (GS):

Ethiopia hosts 27 GS activities (23 VPAs and 4 standalone projects): 19 GS activities have issued 556,017 verified emission reductions (VERs); and additionally, there are 24,458 issued GS CERs;57, 862 issued Planned Emission reductions (PERs). The majority of GS activities (92%) are in the energy efficiency sector.

List of certified GS projects is presented in Annex 2.

b) VEcRRA/Voluntary Carbon Standard (VCS): One project registered, Bale Mountains Eco-region REDD+ project, with no issuance yet.

c) Plan Vivo: One registered project, Ecosystem restoration and valorisation by associations of landless farmers in the Tembien Highlands (North Ethiopia); with 38,600 credits issued.

6 CONSTRAINTS/ GAPS, SUPPORT RECEIVED AND NEEDED

Climate actions, in general, necessitate sufficient financing, the adoption of low-carbon technologies, and the development of technical, planning, and management skills for effective implementation. It is crucial to integrate climate change considerations into national development plans, and Ethiopia prioritizes this approach. The country continues to allocate its national resources towards advancing its low-carbon development agenda and enhancing its adaptive capacity.

6.1 Constraints and Gaps Regarding Preparation and Submission of the BUR and Other Transparency Reports

This section is organized to highlight the constraints and gaps identified during the development process of the First Biennial Update Report (FBUR) and the National Inventory System. The encountered gaps and constraints include:

- Lack of country-specific emission factors, with the Tier 1 method being predominantly used, and the absence of a fully operational information management system for GHG emissions compilation.
- Insufficient financial resources, low awareness, weak coordination among institutions, limited institutional setup, and a lack of clear policies are significant barriers to successful technology transfer.
- Unstable and frequent government organizational restructuring, coupled with a high turnover of trained professionals. For instance, the National Meteorology Institute (NMI) was recently transformed from an agency to an institute, resulting in increased responsibilities and research obligations.
- Inadequate capacity to leverage opportunities presented through south-south cooperation in terms of capacity building and technology transfer.
- Challenges in engaging key actors, particularly local communities, in Measurement, Reporting, and Verification (MRV) processes to ensure sustainability and accountability.
- Technical skill gaps in measuring GHG emissions, assessing mitigation efforts, and implementing adaptation measurement tools. Additionally, a lack of regulations and directives for a national GHG inventory is observed.

- Institutional capacity gaps, including financial, technological, knowledge, and systems required to manage disaggregated and reliable data and information documentation from all sectors of the economy.
- Inflexibility of the IPCC GHG inventory software to accommodate nationally available data such as soil classification and the ability to categorize the entire country under one climate zone, despite its diverse agroecology.

6.2 Constraints and Gaps Implementation of Climate Change Activities Reported Within the BUR

Ethiopia, like many developing countries, faces several challenges in understanding, mitigating, and adapting to climate change. The identified gaps and constraints include:

- Insufficient financial resources, lack of awareness, inadequate coordination, limited institutional setup, and a lack of clear policies are significant barriers to the successful transfer of technologies.
- Low adoption, diffusion, and application of environmentally sound technologies, primarily due to financial constraints, limited capacity, and awareness among users. However, the government has continuously committed to facilitating the identification of relevant technologies and knowledge in various sectors of the economy.
- Ethiopia's rugged topographic features, coupled with the uneven distribution of meteorological stations, present challenges for climate change research and systematic observation programs.
- Instability and frequent government organizational restructuring, along with a high turnover of trained professionals. For example, the transformation of the National Meteorology Institute (NMI) from an agency to an institute has increased its responsibilities and research obligations.
- Limited capacity to leverage opportunities presented through south-south cooperation in terms of capacity building and technology transfer.
- Because of finance limitation inadequate engagement of key actors, particularly local communities, in Measurement, Reporting, and Verification (MRV) processes, posing challenges to sustainability and accountability. Improving the participation of local communities and civil society in MRV is crucial.

- Insufficient networking among stakeholders to effectively address the impacts of climate change.
- Limited technical capacity poses a significant challenge in achieving GHG emission reductions and related benefits at both the local and international levels. Additional support is required to establish a robust system.

6.3 Support Received

Around USD 82 billion is mobilized for the years 2011 to 2019 (or USD 3.2 billion per year) from domestic, bilateral, multilateral sources as well as from international climate finance institutions on climate change mitigation and adaptation projects and programs in agriculture, energy, transport, industry, forest, urban development, health sectors. The above estimation doesn't include the in-kind and free labour contributions of communities in natural resources management, landscape restoration, and other activities. Furthermore, the government contributions in the form of recurrent and capital budget allocations are not fully captured in the estimation. Despite this investment, Ethiopia still needs to attract and mobilize finance to support its climate compatible development agenda (FDRE,2020).

The CRGE Facility has been the main driver behind the mainstreaming of the CRGE Strategy into the overarching national development plan, as well as the MoF's accreditation by the GEF, GCF, FAO and the AF. The data were collected from information available in the public domain including budgets from the website of the GEF databases, and from donors (Table 6-1 and Table 6-2). Some information such as Donor Off-Budget financial Support received was culled from the main recipients corresponding to the Ministry of Finance, CRGE facility. Projects with insufficient details and or inadequate information and those less than $50,000 have been excluded, benchmarking it on the limit set by the GEF Small Grant Projects. This highlighted summary of the financial report contains information on the recent climate change financial flows Ethiopia has received between 2011 and 2019. They are categorized according to domestic and external contributions, the former consisting primarily of budgetary allocations by the FDRE Government, and the latter are resources received from external sources including international/multilateral and bilateral partners as well as the GEF, GCF and AF.

Table 6-1: Summary of mobilized fund at national level Source: Ministry of Finance

Type of source	Doner	Year of Approval	Amount in US$ (million)
Bilateral	UK	2012	25.00
	Austria	2012	0.83
	Norway	2013	16.00
	Denmark	2016	4.60
Multilateral	REDD+	2016	80.00
	AF	2017	9.90
	GCF	2017	45.00
	World Bank	2017	1.50
FDRE budget		2017	5.00
Total			192.83

Table 6-2: GEF Climate change -specific support received

ID	Title	Focal Areas	Grant	Co-Financing	Implementing Agencies	Fund Source	Period	Status
10683	PSG: Sustainable Land Management Project 2	Land Degradation, Biodiversity, Climate Change	$12,962,963	$94,655,517	The World Bank	Multi Trust Fund	GEF-5	Completed
9669	Promoting Autonomous Adaptation at the community level in Ethiopia	Climate Change	$5,307,885	$24,721,020	United Nations Development Programme	Least Developed Countries Fund	GEF-4	Completed
9135	Coping with Drought and Climate Change	Climate Change	$995,000	$0	United Nations Development Programme	Special Climate Change Fund	GEF-3	Completed
6967	National Adaptation Programme of Action (NAPA)	Climate Change	$200,000	$0	United Nations Development Programme	Least Developed Countries Fund	GEF-3	Completed

5501	Climate Change Enabling Activity (additional financing for capacity building in priority areas)	Climate Change	$100,000	$0	United Nations Development Programme	GEF Trust Fund	GEF-3	Completed
5440	Renewable Energy Project	Climate Change	$4,930,000	$10,400,000	The World Bank	GEF Trust Fund	GEF-3	Completed
4078	Enhancing Adaptive Capacity of communities by up-scaling best practices and adopting an integrated approach in Ethiopia	Climate Change	$8,932,420	$72,200,000	United Nations Development Programme	Least Developed Countries Fund	GEF-7	Concept Approved
3736	Capacity-building Program to Comply with the Paris Agreement and Implement its Transparency Requirements at the National Level	Climate Change	$1,166,000		United Nations Development Programme	Capacity-building Initiative for Transparency	GEF-6	Project Approved

				$192,000				
3154	Climate Change Adaptation in the Lowland Ecosystems of Ethiopia	Climate Change	$5,836,073	$10,450,000	United Nations Development Programme	Least Developed Countries Fund	GEF-6	Project Approved
1811	Ethiopian Urban NAMA: Creating Opportunities for Municipalities to Produce and Operationalize Solid Waste Transformation (COMPOST)	Climate Change	$6,667,123	$47,112,888	United Nations Development Programme	GEF Trust Fund	GEF-6	Project Approved
1686	CCA Growth: Implementing Climate Resilient and Green Economy plans in highland areas in Ethiopia	Climate Change	$6,277,000	$10,450,000	United Nations Development Programme	Least Developed Countries Fund	GEF-6	Project Approved

1651	Promoting Sustainable Rural Energy Technologies (RETs) for Household and Productive Uses	Climate Change	$4,091,781	$69,045,899	United Nations Development Programme	GEF Trust Fund	GEF-5	Project Approved
1239	Strengthening Climate Information and Early Warning Systems to Support Climate Resilient Development and Adaptation to Climate Change	Climate Change	$4,900,000	$33,336,410	United Nations Development Programme	Least Developed Countries Fund	GEF-5	Project Approved
318	Enabling Ethiopia to Prepare its First National Communication in Response to its Commitments to UNFCCC	Climate Change	$213,210	$0	United Nations Development Programme	GEF Trust Fund	GEF-1	Project Approved
			$62,579,455	$372,563,734				

6.4 Support Needed

Ethiopia is seeking financial assistance to support its capacity building, report preparation, and technical implementation of its Nationally Determined Contributions (NDC) to effectively address climate change and achieve its long-term climate and development objectives. The successful realization of Ethiopia's ambitious climate goals will contribute significantly to its broader development agenda. This request for support from the international community underscores Ethiopia's commitment and specific needs in this regard. Information on the support received by relevant ministries and agencies of the Federal Democratic Republicof Ethiopia (FDRE) is available to the public, as applicable.

Enhancing institutional arrangements, improving technical skills for measuring and accounting for adaptation and mitigation efforts, and strengthening monitoring and tracking of losses and damages are key challenges that require practical support in the country. Additionally, addressing data management issues and aligning the existing Measurement, Reporting, and Verification (MRV) system with the Monitoring and Evaluation (M&E) framework are also areas where assistance is needed.

6.4.1 Financial Need

The updated Nationally Determined Contributions (NDC) of Ethiopia clearly distinguish between the efforts, both in mitigation and adaptation, that the country will pursue unconditionally using domestic finance and those that will be pursued conditionally with international support. The updated NDC includes a commitment to a meaningful financial contribution from domestic resources, as well as a willingness to explore further increases in ambition throughout the NDC period.

In terms of cost, the estimated total cost of implementing the NDC between 2020 and 2030 amounts to $316 billion. From which US $275.5 billion (close to 87.2%) will be for mitigation actions against the corresponding figure of US $40.5 billion (about 12.8%) for adaptation interventions. The estimate further shows that, of the financing needs, 20% is unconditional (which is US $ 63.2 billion) to be raised domestically against the corresponding conditional amount of US $ 252.8 billion to be secured from international climate financial support. Ethiopia is committed for an investment of 63.2 billion on climate change mitigation and adaptation actions from domestic sources, but is expecting the remaining (conditional) finance of USD 252.8 billion to be received from international climate finance sources. Of this total cost, 20% will be financed domestically, while the remaining 80% will require international

support. The distribution assumes that Ethiopia will prioritize the implementation of the least-cost mitigation and adaptation actions to achieve its unconditional targets during the NDC period.

6.4.2 Technical and Capacity Building Needs

Ethiopia's technical and capacity needs are significant. However, both the National Greenhouse Gas (NGHG) inventory and the Measurement, Reporting, and Verification (MRV) section highlight a common and urgent challenge: the lack of mechanisms to collect and update reliable data that meet the minimum requirements, such as Tier 1 reporting according to IPCC guidelines. Efforts have been made to develop systems and build capacity in key institutions to conduct GHG inventories in line with IPCC guidelines and standards. However, several challenges persist, as outlined in the preceding section of this FBUR, particularly regarding data availability, data collection capacity, GHG computation, and the necessary resources to gather and utilize the data to meet minimum requirements.

While Ethiopia may not have received extensive support compared to other least-developed countries, certain forms of support may have been embedded as components of identified financial inflows. That being said, the following areas, as listed in the Updated NDC and other sources, are primary areas where support is needed:

- Strengthening the MRV system and its institutional setup, including the provision of adequate infrastructure and human resources.
- Establishing a public expenditure review framework across all government institutions at all levels to enable the disaggregation of distinct budgetary flows and allocations.
- Supporting the integration of MRV/M&E with the general national statistical data management system.
- Enhancing accessibility and availability of data through state-of-the-art technology.
- Strengthening coordination among sectors and regional counterparts to ensure better implementation, monitoring, and evaluation of the NDC.
- Facilitating technology transfer, including in areas such as clean cement production, early warning systems, and sustainable catchment and land use management.
- Providing technical and financial support for measuring and tracking adaptation actions and progress towards the NDC.

It should be noted that this list is not exhaustive and additional areas of support may exist.

ETF transition and implementation

The government has taken actions to establish the national Measurement, Reporting, and Verification (MRV) system at a direct level in 2016. Following this, the government has mandated all line ministries to establish units/directorates responsible for the implementation of the Climate Resilient Green Economy (CRGE) strategy, updating the second Nationally Determined Contributions (NDC), and submitting them to the United Nations Framework Convention on Climate Change (UNFCCC). Additionally, the country has developed a Long-term Low Emission Development Strategy and has commenced its implementation this year. Furthermore, new institutional arrangements have been established to govern the CRGE strategy, ensuring the measurement, reporting, and verification of the country's greenhouse gas (GHG) emissions by source and removal by sink.

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8 ANNEXES

8.1 ANNEX 1: LIST OF GOLD STANDARD ACTIVITIES IN ETHIOPIA

GS ID:	Project	Project Developer	Project Type	Verified Emission Reductions	Methodology	Crediting Period
GS2722	Fuel efficient stoves for Ethiopia Programme of Activities CPA 001	atmosfair gGmbH	Energy Efficiency - Domestic	24,458	AMS-II.G. Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass	Nov 15, 2014 — Nov 14, 2021
GS3007	Sodo Ethiopia	World Vision Australia	Other	157,862	-	May 08, 2013 — May 07, 2023
GS3422	Improved Cook Stoves in Pastoral and Agro-Pastoral Communities in Southern Ethiopia	Carbon sink (Carbon sink Group S.r.l.)	Energy Efficiency - Domestic	45,989	GS MS Simplified Methodology for Efficient Cookstoves v1.	Oct 12, 2014 — Oct 11, 2021
GS5325	GS1247 VPA 89 Southern Ethiopia Efficient Cook Stoves	CO_2 balance UK ltd	Energy Efficiency - Domestic	37,528	-	Feb 04, 2017 — Feb 03, 2024
GS5326	GS1247 VPA 90 Southern Ethiopia Efficient Cook Stoves	CO_2 balance UK ltd	Energy Efficiency - Domestic	36,943	-	Apr 08, 2017 — Apr 07, 2024
GS5323	GS1247 VPA 87 Southern Ethiopia Community Boreholes	CO_2 balance UK ltd	Energy Efficiency - Domestic	26,029	GS TPDDTEC v1.	Jun 10, 2017 — Jun 09, 2024
GS5463	Oromia Cookstove	Oromia Coffee Farmers'		44,740		

	Distribution Project	Cooperative Union	Energy Efficiency - Domestic		GS TPDDTEC v2.	Jan 01, 2016 — Dec 31, 2022
GS6038	GS1247 VPA 128 Southern Ethiopia Community Boreholes	CO_2 balance UK ltd	Energy Efficiency - Domestic	22,932	GS TPDDTEC v1.	Jun 14, 2017 — Jun 13, 2024
GS922	Solar Lighting in Rural Ethiopia - Vpa 1	my climate Foundation	Solar Thermal - Electricity	51,159	AMS-I.A. Electricity generation by the user	Sep 13, 2010 — Sep 13, 2020
GS5322	GS1247 VPA 86 Southern Ethiopia Community Boreholes	CO_2 balance UK ltd	Energy Efficiency - Domestic	26,483	GS TPDDTEC v1.	Jun 07, 2017 — Jun 06, 2024
GS5324	GS1247 VPA 88 Southern Ethiopia Community Boreholes	CO_2 balance UK ltd	Energy Efficiency - Domestic	24,619	GS TPDDTEC v1.	Jun 14, 2017 — Jun 13, 2024
GS6037	GS1247 VPA 127 Southern Ethiopia Community Boreholes	CO_2 balance UK ltd	Energy Efficiency - Domestic	25,929	GS TPDDTEC v1.	Jun 22, 2017 — Jun 21, 2024
GS7288	GS1247 VPA 166 Southern Ethiopia Community Safe Water	CO_2 balance UK ltd	Energy Efficiency - Domestic	3,357	GS TPDDTEC v1.	Apr 11, 2019 — Apr 10, 2024
GS7289	GS1247 VPA 168 Southern Ethiopia Community Safe Water	CO_2 balance UK ltd	Energy Efficiency - Domestic	3,403	GS TPDDTEC v1.	Mar 16, 2019 — Mar 15, 2024
GS7290	GS1247 VPA 169 Southern Ethiopia Community Safe Water	CO_2 balance UK ltd	Energy Efficiency - Domestic	3,641	GS TPDDTEC v1.	Mar 13, 2019 — Mar 12, 2024

GS7291	GS1247 VPA 170 Southern Ethiopia Community Safe Water	CO_2 balance UK ltd	Energy Efficiency - Domestic	3,373	GS TPDDTEC v1.	Feb 28, 2019 — Feb 27, 2024
GS6784	GS1247 VPA 150 Southern Ethiopia Community Safe Water	CO_2 balance UK ltd	Energy Efficiency - Domestic	20,384	GS TPDDTEC v1.	Aug 30, 2017 — Aug 29, 2024
GS6836	GS1247 VPA 156 Southern Ethiopia Community Protected Springs	CO_2 balance UK ltd	Energy Efficiency - Domestic	21,013	GS TPDDTEC v 2.	Sep 12, 2017 — Sep 11, 2024
GS6783	GS1247 VPA 149 Southern Ethiopia Community Safe Water	CO_2 balance UK ltd	Energy Efficiency - Domestic	19,888	GS TPDDTEC v 2.	Oct 11, 2017 — Oct 10, 2024
GS7293	GS1247 VPA 172 Southern Ethiopia Efficient Cook Stoves	CO_2 balance UK ltd	Energy Efficiency - Domestic	21,652	GS TPDDTEC v 1	Feb 12, 2019 — Feb 11, 2024
GS7287	GS1247 VPA 165 Southern Ethiopia Community Safe Water	CO_2 balance UK ltd	Energy Efficiency - Domestic	3,223	GS TPDDTEC v 1	May 11, 2019 — May 10, 2024
GS6749	GS5658 VPA 4: Resilience with Safe Drinking Water in Drought Prone Areas of Bale Zone in Oromia (Ethiopia)	Carbon Sink (Carbonsink Group S.r.l.)	Energy Efficiency - Domestic	11,397	GS TPDDTEC v3.1	Sep 01, 2018 — Aug 31, 2023
GS7391	GS1247 VPA 188 Southern Ethiopia Efficient Cook Stoves	CO_2 balance UK ltd	Energy Efficiency - Domestic	17,742	GS TPDDTEC v 1.	May 06, 2019 — May 05, 2024
GS3509	GS1289: Hydraid Biosand Water Filter Programme	Native Energy, Inc.	Energy Efficiency	48,788	GS TPDDTEC v 1.	Aug 03, 2015 —

	East Africa: VPA (02) Ethiopia		- Domestic			Aug 02, 2025
GS7437	GS1247 VPA 189 Southern Ethiopia Efficient Cook Stoves	CO_2 balance UK ltd	Energy Efficiency - Domestic	14,261	GS TPDDTEC v 1.	Mar 26, 2019 — Mar 25, 2024
GS7436	GS5658 VPA 10: Resilience with Safe Drinking Water in Drought Prone Areas of Bale Zone in Oromia (Ethiopia), Phase II	Carbon Sink (Carbonsink Group S.r.l.)	Energy Efficiency - Domestic	11,978	GS TPDDTEC v3.1	Oct 15, 2018 — Oct 14, 2023
GS10220	Humbo Ethiopia Assisted Natural Regeneration Project	World Vision Australia	Other	104,067	GS GHG A.R GHG Emissions Reduction Sequestration v1.	Dec 01, 2006 — Nov 30, 2036
GS7556	GS5658 VPA 12: Improved Cookstoves for Environmental Conservation in Southern Ethiopia	Carbon Sink (Carbonsink Group S.r.l.)	Energy Efficiency - Domestic	8,120	GS MS Simplified Methodology for Efficient Cookstoves v1.	Nov 02, 2019 — Nov 01, 2024
GS10872	GS5658 VPA 29: Improved Cookstoves for Environmental Conservation in Southern Ethiopia	Carbon Sink (Carbonsink Group S.r.l.)	Energy Efficiency - Domestic	6,159	GS MS Simplified Methodology for Efficient Cookstoves v1.	Jan 02, 2020 — Jan 01, 2021
GS10873	GS5658 VPA 30: Improved Cookstoves for Environmental Conservation in Southern Ethiopia	Carbon Sink (Carbonsink Group S.r.l.)	Energy Efficiency - Domestic	4,966	GS MS Simplified Methodology for Efficient Cookstoves v1.	Feb 28, 2020 — Feb 27, 2025

Source: Gold Standard: Impact Registry https://registry.goldstandard.org/projects?q=&page=1&countries=ET

8.2 ANNEX 2: GEF LINKED CLIMATE-BIODIVERSITY AND DEGRADATION FINANCIAL SUPPORT RECEIVED

ID	Title	Focal Areas	Grant and Co-financing	Implementing Agencies	Fund Source	Period	Status
10683	PSG: Sustainable Land Management Project 2	Land Degradation, Biodiversity, Climate Change	$12,962,963 $94,655,517	The World Bank	Multi Trust Fund	GEF-5	Completed
10174	Enabling Activities to Review and Update the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs)	Persistent Organic Pollutants	$227,000 $245,000	United Nations Industrial Development Organization	GEF Trust Fund	GEF-5	Completed
9967	Investment Promotion on Environmentally sound Management of Electrical and Electronic Waste: Up-Scale and Promotion of Activities and Initiatives on Environmentally Sound Management of Electrical and Electronic Waste	Persistent Organic Pollutants	$1,000,000 $1,955,555	United Nations Industrial Development Organization	GEF Trust Fund	GEF-5	Completed
9669	Promoting Autonomous Adaptation at the community level in Ethiopia	Climate Change	$5,307,885 $24,721,020	United Nations Development Programme	Least Developed Countries Fund	GEF-4	Completed
9303	Mainstreaming Agro-biodiversity Conservation into the Farming Systems of Ethiopia	Biodiversity	$3,863,600 $5,150,000	United Nations Development Programme	GEF Trust Fund	GEF-4	Completed

9157	SIP: Community-Based Integrated Natural Resources Management in Lake Tana Watershed	Land Degradation	$4,400,000 $21,024,500	International Fund for Agricultural Development	GEF Trust Fund	GEF-4	Completed
9135	Coping with Drought and Climate Change	Climate Change	$995,000 $0	United Nations Development Programme	Special Climate Change Fund	GEF-3	Completed
9048	SIP: Country Program for Sustainable Land Management (ECPSLM)	Land Degradation	$9,000,000 $28,800,000	The World Bank	GEF Trust Fund	GEF-4	Completed
6967	National Adaptation Programme of Action (NAPA)	Climate Change	$200,000 $0	United Nations Development Programme	Least Developed Countries Fund	GEF-3	Completed
5501	Climate Change Enabling Activity (additional financing for capacity building in priority areas)	Climate Change	$100,000 $0	United Nations Development Programme	GEF Trust Fund	GEF-3	Completed
5440	Renewable Energy Project	Climate Change	$4,930,000 $10,400,000	The World Bank	GEF Trust Fund	GEF-3	Completed
5220	National Capacity Self-Assessment (NCSA) for Global Environmental Management		$130,000 $0	United Nations Environment Programme	GEF Trust Fund	GEF-3	Completed
5107	Enabling Activities to Facilitate Early Action on the Implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs)	Persistent Organic Pollutants	$496,000 $0	United Nations Industrial Development Organization	GEF Trust Fund	GEF-3	Completed

5040	Sustainable Development of the Protected Area System	Biodiversity	$9,000,000 $22,479,000	United Nations Development Programme	GEF Trust Fund	GEF-3	Completed
4992	Conservation and Sustainable Use of Medicinal Plants	Biodiversity	$1,802,000 $3,284,000	The World Bank	GEF Trust Fund	GEF-2	Completed
4529	National Biodiversity Strategy, Action Plan, Participation in Clearing House Mechanism for CBD, and Country Report to the COP	Biodiversity	$331,930 $0	United Nations Development Programme	GEF Trust Fund	GEF-2	Completed
4222	A Dynamic Farmer-Based Approach to the Conservation of African Plant Genetic Resources	Biodiversity	$2,456,300 $0	United Nations Development Programme	GEF Trust Fund	Pilot Phase	Completed
4091	Promotion of circular economy in the textile and garment sector through the sustainable management of chemicals and waste in Ethiopia	Chemicals and Waste	$3,000,000 $20,140,000	United Nations Industrial Development Organization	GEF Trust Fund	GEF-7	Concept Approved
4078	Enhancing Adaptive Capacity of communities by up-scaling best practices and adopting an integrated approach in Ethiopia	Climate Change	$8,932,420 $72,200,000	United Nations Development Programme	Least Developed Countries Fund	GEF-7	Concept Approved
3736	Capacity-building Program to Comply with the Paris Agreement and Implement its Transparency Requirements at the National Level	Climate Change	$1,166,000 $192,000	United Nations Development Programme	Capacity-building Initiative for Transparency	GEF-6	Project Approved
3367	PCB Management in Ethiopia to Meet the 2025 Stockholm Convention Deadline - Phase 1	Chemicals and Waste	$1,990,000 $8,350,000	United Nations Development Programme	GEF Trust Fund	GEF-6	Project Approved

3154	Climate Change Adaptation in the Lowland Ecosystems of Ethiopia	Climate Change	$5,836,073 $10,450,000	United Nations Development Programme	Least Developed Countries Fund	GEF-6	Project Approved
2794	Enhanced Management and Enforcement of Ethiopia's Protected Areas Estate	Biodiversity	$7,294,495 $83,411,481	United Nations Development Programme	GEF Trust Fund	GEF-6	Project Approved
1960	Food-IAP: Integrated Landscape Management to Enhance Food Security and Ecosystem Resilience	Land Degradation, Biodiversity	$10,239,450 $144,965,431	United Nations Development Programme	GEF Trust Fund	GEF-6	Project Approved
1686	CCA Growth: Implementing Climate Resilient and Green Economy plans in highland areas in Ethiopia	Climate Change	$6,277,000 $10,450,000	United Nations Development Programme	Least Developed Countries Fund	GEF-6	Project Approved
1651	Promoting Sustainable Rural Energy Technologies (RETs) for Household and Productive Uses	Climate Change	$4,091,781 $69,045,899	United Nations Development Programme	GEF Trust Fund	GEF-5	Project Approved
1509	Mainstreaming Incentives for Biodiversity Conservation in the Climate Resilient Green Economy Strategy (CRGE)	Biodiversity	$3,316,455 $16,000,000	United Nations Development Programme	GEF Trust Fund	GEF-5	Project Approved
1239	Strengthening Climate Information and Early Warning Systems to Support Climate Resilient Development and Adaptation to Climate Change	Climate Change	$4,900,000 $33,336,410	United Nations Development Programme	Least Developed Countries Fund	GEF-5	Project Approved
631	GEF National Portfolio Formulation Document		$0	GEF Secretariat	GEF Trust Fund	GEF-5	Project Approved

			$0				
630	Capacity Building for Access and Benefit Sharing and Conservation and Sustainable Use of Medicinal Plants	Biodiversity	$2,047,000 $2,500,000	United Nations Environment Programme	GEF Trust Fund	GEF-4	Project Approved
351	BS Implementation of Cartagena Protocol on Biosafety through Effective Implementation of National Biosafety Framework	Biodiversity	$616,000 $700,000	United Nations Environment Programme	GEF Trust Fund	GEF-4	Project Approved

8.3 ANNEX 3: FINANCIAL FLOWS: - DONOR OFF-BUDGET LINKED CLIMATE, AGRICULTURE, ENVIRONMENTAL PROTECTION AND WATER RELATED SUPPORT RECEIVED

Amounts are in thousands (000) - USD

Project Title	Status	Donor Agency	Type of assistance	Funding							
				2016		2017		2018		2019	
				Actual Commitments	Actual Disbursements	Actual Commitments	Actual Disbursements	Actual Commitments	Actual Disbursements	Actual Commitments	Actual Disbursements
"Implementation of holistic management and climate smart agriculture in the Baso River catchment, Arba Minch zuria woreda, SNNPR, Ethiopia,2016-2018"	Completed	Czech Republic	Grant	504	160	0	63.6	0	175.6	0	0
(CDAIS baby 4 Ethiopia) Capacity Development for Agricultural Innovation Systems (CDAIS)	Completed	Food and Agricultural Organization	Grant	0	0	0	0	0	0	0	188
(Emergency preparedness and response) RELIEF /IDP 2019 -2020-(2020-2025)	Ongoing	World Food Programme	Grant	0	0	0	0	0	0	0	7318.843
(PPP) Integrated agricultural interventions to	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	0	0	0	0	0	0	430.663

generate income and promote a behavioural change of extremely poor households in two Woredas of Gurage Zone, SNNPR											
(PPP) Capacity building for climate change response on forest sector in Ethiopia	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	0	0	0	0	200	0	218.104
(PPP) Hetossa Watershed Based Integrated food and livelihood security project	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	100	0	0	0	0	0	0
(PPP) Increased HH Income by Establishing Seed System to Potato Production Project	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	221.239	0	221.239	0	0	0	432.727
(PPP) Village Cooperative Capacity Building Project in Arsi Zone, Ethiopia	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	0	0	0	0	0	0	47.604
2008.65.527 Sustainable Land Management Program (SLM I) and 2002.65.660 SUN Program (KfW)	Completed	Germany	Grant	0	259.1513381	0	348.4991548	0	141.27025	0	0

2011.2134.2 Sustainable Land Management (SLM II) (GIZ)	Completed	Germany	Grant	0	1.320067	0	0	0	0	0	0
2011.6550.5 Sustainable Land Management Program (SLM II) (KfW)	Completed	Germany	Grant	0	2858.318516	0	3362.162302	0	718.01356	0	564.5451863
2012.97.571 Strengthening Drought Resilience of the Pastoral and Agro-Pastoral Population in the Lowlands (Afar) of ETH (KfW)	Completed	Germany	Grant	0	0	0	831.91289	0	219.33	0	645.387507
2012.9761.3 Strengthening Drought Resilience of Pastoral and Agro-Pastoral Livelihoods in Ethiopian Lowlands (GIZ)	Completed	Germany	Technical assistance	0	841.6071877	0	2252.093754	0	2278.556346	0	1118.023559
2012.9766.2 Implementation of participatory forest management (PFM) in or adjacent areas of the SLM-program (GIZ)	Completed	Germany	Grant	0	405.952817	0	767.9535013	0	171.0047792	0	0
2013.9064.0 Contribution to Increase Agricultural	Completed	Germany	Grant	0	1880.849175	0	3173.868729	0	0	0	0

Productivity (GIZ/ BMEL)											
2014.2006.6 Sustainable Land Management (SLM III) (GIZ)	Ongoing	Germany	Technical assistance	0	8527.418551	0	11465.29247	0	4761.382058	0	1556.692776
2014.2008.2 Conservation of Biodiversity and Sustainable Management of Natural Resources. GIZ	Completed	Germany	Technical assistance	0	0	5169.081694	0	0	6483.542864	0	2870.992809
2014.2009.0 Strengthening Drought Resilience of Pastoral and Agro-Pastoral Livelihood in Ethiopian ASAL (GIZ)	Ongoing	Germany	Grant	0	2214.012359	0	2778.814416	0	1844.681586	0	769.6031845
2014.2477.9 Increasing agricultural productivity through innovation (incl. mechanization) (GIZ)	Ongoing	Germany	Grant	0	594.6216495	0	3018.905974	0	811.6369904	0	0
2014.6711.7 Sustainable Land Management (SLM III) (KfW)	Ongoing	Germany	Grant	0	0	0	1363.84432	0	0	0	340.1569407
2015.0124.6- Responsible Land Policy- Support to Responsible	Ongoing	Germany	Technical assistance	0	0	0	0	0	0	10096.08	483.4355608

Agricultural Investment in Ethiopia (S2RAI)											
2016.0116.0: - Trilateral Resilience Enhancement in Ethiopia Lowlands (Afar)- TREE Project-GIZ	Ongoing	Germany	Technical assistance	1109.3	230.5263995	0	294.1269518	0	159.7473648	0	192.5340765
2016.0123.6 Improvement of Food Security and Disaster Risk Management in order to Strengthen the Resilience in Afar	Ongoing	Germany	Technical assistance	5546.5	0	0	1247.861101	0	1649.346965	0	1381.690983
2016.2190.3- Innovation for Agriculture Supply Chains (ISASE)	Completed	Germany	Technical assistance	0	0	0	0	0	0	1592.3628	537.74965
2017.2091.1- Natural Resources Stewardship Programme (Natures)	Ongoing	Germany	Technical assistance	0	0	0	0	0	0	1359	275.915
2017.2147.1 Sustainable Land Management (SLM) TC	Ongoing	Germany	Technical assistance	0	0	15138.5	0	0	3.405288	0	6284.381658
2017.2149.7 Conservation and Sustainable use of Natural Resources; Biodiversity. TC	Ongoing	Germany	Technical assistance	0	0	5240.25	0	0	0	0	1230.8473

2017.2151.3 Agricultural Mechanization and Technology for Small holder Productivity. TC	Ongoing	Germany	Technical assistance	0	0	4658	0	0	439.4179072	0	1452.176404
2017.2206.5 - Participative Land nutzungsplanung (only German Name)	Ongoing	Germany	Technical assistance	0	0	0	0	0	0	0	345.725843
2017.2206.5- Participatory Land Use Planning (PLUP)	Ongoing	Germany	Technical assistance	0	0	0	0	0	0	3422.4	451.4929478
2017.6743.3 Program Sustainable Land Management (SLM IV) FC	Ongoing	Germany	Grant	0	0	20961	0	0	0	0	0
2017.9117.7- Promoting Trust- based Dialogue on Land and Resources Management in Oromia Region, Ethiopia (CPS)	Ongoing	Germany	Technical assistance	0	0	0	0	4257.515	0	0	498.8440725
2019.2037.00- Sustainable Production of Textile and Clothing in Ethiopia	Ongoing	Germany	Technical assistance	0	0	0	0	0	0	0	686.5341547
2019.4942.9- Cluster Support for the agricultural and food industries in Ethiopia	Ongoing	Germany	Technical assistance	0	0	0	0	0	0	15615.6	201.402

2019/SEP/0000400110	Ongoing	Spain	Grant	0	0	0	0	0	0	0	0
202062222 European union support to sustainable land management of Ethiopia	Completed	Germany	Grant	0	0	9.9123676	1335.7251	0	189.215232	0	1162.554662
A Financial audit of a project entitled 'Urban Social protection in Ethiopia (USPE)- DCI-HUM/2011/237-029	Ongoing	European Union	Grant, Technical assistance	0	22.1283164	0	0	0	0	0	0
A new approach to the conservation of wild Coffea arabica in south-west Ethiopia: exploring the potential of participatory forest	Ongoing	European Union	Grant	0	0	0	724.597792	0	0	0	0
A sustainable community-based seed production system fulfilling the current Unmet seed Demand	Completed	IRISH AID	Grant	887.44	887.44	670.02	637.8	570.3	570.3	0	328.05
AGP (Agricultural Growth Plan)	Ongoing	CIDA Canada	Grant	26055.63385	4598.34978	0	4848.114124	0	6800.464506	0	15.7085586
AGP 2 2016/SPE/0000400113 AGP 2 2017/SPE/000400126	Ongoing	Spain	Grant	0	156.585	0	1.1849	0	0	0	0

AGP II Multi Donor Trust Fund	Completed	Netherlands	Grant	21739.13	5434.783	0	0	0	0	0	0
AGRINVEST-Enabling inclusive and efficient Private Sector Investment in agri-food System	Ongoing	Food and Agricultural Organization	Grant	0	0	0	0	0	0	2500	0
Addis Ababa Gerbi Dam Reservoir, Transmission Line and Treatment Plant Project	Ongoing	China	Loan	135880	0	0	0	0	0	0	39650.83217
Additional Finance for Tana & Beles Integrated Water Resources Development	Ongoing	International Development Association	Loan	0	5115.532	0	0	0	0	0	0
Additional Financing for Urban Water Supply and Sanitation Project	Ongoing	International Development Association	Loan	0	20426.921	0	23884.068	0	12343.462	0	0
Additional loan for Irrigation and Drainage Project	Ongoing	International Development Association	Loan	0	3280.317	0	13751.953	0	3577.759	0	0
Advisory for Agricultural Development	Ongoing	JICA	Technical assistance	0	394.231455	0	16.72511375	0	0	0	0
Agricultural Commercialization	Ongoing	Netherlands	Grant	0	0	0	0	0	0	50000	12500

Clusters Imitative Program											
Agricultural Growth Programme (AGP)-2012-15	Ongoing	United Nations Development Program	Grant	0	3400.328	0	566.529	0	631.375	0	0
Agricultural Growth Programme II Component I	Ongoing	CIDA Canada	Grant	0	0	0	0	0	0	0	0
Agricultural Growth Project	Ongoing	International Development Association	Grant, Loan	0	8900.019	0	0	0	0	0	0
Agricultural Transformation Agency	Completed	Netherlands	Grant	9456.522	1229.348	572.8	1842.8	0	2382.753	0	1664.757
Agriculture Vocational Education Team	Ongoing	China	Grant	0	362.5738244	0	0	0	0	0	0
Argo-Business Induced Growth Programme in Amhara National Regional State (AGRO-BIG)	Completed	Finland	Grant	0	2058.473654	0	160.0633708	0	0	0	0
Audit expenses linked to the implementation of the EDF	Ongoing	European Union	Technical assistance	22.1349722	0	0	10.5676384	0	20.6486298	0	82.6891251
Axum Water Supply Project	Ongoing	Kuwait	Loan	0	0	0	0	0	0	0	0

Bale Eco-region REDD+ Pilot Project Phase II	Ongoing	Norway	Grant	0	806.236638	0	0	0	0	0	0
Bale Ecoregion REDD+ pilot project phase II	Ongoing	Norway	Grant	0	806.2611455	0	246.3573743	0	557.7361429	0	581.2207803
Batch of Anti-Locust Supplier Equipment	Ongoing	China	In-kind	0	0	0	0	0	0	2252.407705	2252.407705
Bilateral Ethiopian-Netherlands Effort for Food, Income and Trade (BENEFIT) Partnership project.	Ongoing	Netherlands	Grant	0	7410.188339	1288.783041	11041.15305	10577.58278	3749.622584	0	18821.67895
Boosting Integrated Rural Development (BIRD) – A Red Cross Water, Sanitation and Hygiene Project in Benishangul Gumuz, Ethiopia	Completed	European Union	Grant	0	384.0662832	0	0	0	0	0	0
Building Rural Income through inclusive Dairy Business Growth in Ethiopia. (BRIDGE)	Ongoing	Netherlands	Grant	0	0	0	0	23733.80468	2048.009701	0	3515.683714
Bus Rapid Transit - Urban Development Addis Ababa	Ongoing	France	Loan	38825.5	579.9509144	0	1178.6	0	0	0	0
CET 1040 01 M (Loan) and CET 1040 02 N (Technical Assistance)-Water Resources Development Fund	Ongoing	France	Grant, Technical assistance	1109.3	0	0	0	0	0	0	0

(Small towns water supply project)											
CET 1046 01 X and CET 1046 03 R (BRT B2)- Addis Ababa City Administration Bus Rapid transit	Ongoing	France	Loan	19412.75	0	0	0	0	0	0	0
CET 1073 01 U- Urban Institution and Infrastructure Development Programme (UIIDP)	Ongoing	France	Grant	0	0	0	0	11578	0	0	1536.346353
CET 1086 01 Y- Social Impact Reinforcement Project to the Second Urban Water Supply and Sanitation Program (UWSSP- II)	Ongoing	France	Grant	0	0	0	0	0	0	0	0
CET 6002 01 R- Solid Waste Management in Addis Ababa	Completed	France	Grant	0	300.7254885	0	61.1661974	0	88.2519754	0	60.7861909
Capacity Building on Irrigation and Rural Development (CBIRD) in Dodota District (Correct)	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	1008.8	0	2655	0	603.642	0	4981.211
Capacity Development for Agricultural Growth	Ongoing	CIDA Canada	Grant	0	0	0	0	0	1988.256489	0	21.50667493
Certified Forest Coffee production and Promotion	Ongoing	JICA	Technical	0	1320.007903	0	724.9604195	0	0	0	0

			assistance								
Chief Advisor/Water Capacity Building	Ongoing	JICA	Technical assistance	0	186.1290229	0	0	0	0	0	0
China-Africa Bamboo Center Project	Ongoing	China	Grant	0	0	0	0	58125.58058	0	0	0
Climate Action through Landscape Management (CALM) PforR	Ongoing	International Development Association	Grant	0	0	0	0	0	0	500000	118285.15
Climate Change Sector Reform Performance Contract in Ethiopia	Ongoing	European Union	Treasury	0	0	0	0	0	0	40413.6	13196.4
Climate Smart Agriculture and Agribusiness Program (CSAAB)	Ongoing	United Nations Entity for Gender Equality and the Empowerment of Women	Technical assistance	0	0	0	0	0	0	2000	0
Community-based Integrated Natural Resources Management Project	Ongoing	International Fund for Agricultural Development (IFAD)	Grant, Loan	0	2480.579	0	2015.554	0	753.316	0	0
Completion of Hydrogeological Mapping of Ethiopia.	Completed	Czech Republic	Grant	505.04	53.5	0	150.3	0	221.3	0	127.855

Conservation and Sustainable Use of Biodiversity for Forest and Biosphere Reserve in Ethiopia	Ongoing	Germany	Grant	0	0	0	0	23268	0	0	303.2636355
Conservation and Sustainable Use of Biodiversity for Forest and Biosphere Reserve in Ethiopia (KFW)) BMZ No 2015 67 197	Ongoing	Germany	Grant	0	0	0	0	23268	0	0	0
Contribution to the AGP-II Pooled Fund 2016	Completed	Spain	Grant	2218.6	1565.85	0	0	0	0	0	0
Contribution to the AGP-II Pooled Fund 2016	Completed	Spain	Grant	2218.6	1663.95	0	0	0	0	0	0
Co-financing of productive SafetyNet program (PSNP)	Ongoing	CIDA Canada	Grant	0	11704.71562	0	0	0	11345.96303	0	0
DEUTSCHE WELTHUNGERHILFE(AGRO ACTION) - MDGS WATER+SAN PROGRAMME IN RURAL AMHARA	Ongoing	European Union	Grant	0	0	0	713.2652076	0	0	0	0
Delivering Climate Resilient Water and Sanitation in Ethiopia (Project Number: 205027)	Ongoing	FCDO former DFID	Technical assistance	0	0	0	0	22071.20571	0	0	0

Developing National Implementation Capacities for the control of Tsetse and Animal African Trypanosomiasis in Ethiopia	Ongoing	Food and Agricultural Organization	Grant	0	0	0	0	237	0	0	81.879
Development Engagement on Agricultural Commercialization Cluster	Ongoing	Denmark	Grant	0	0	0	0	53515.28472	0	0	0
Development Engagement on Productive Safety Net and Resilience	Ongoing	Denmark	Grant	0	0	0	0	45870.24405	0	0	0
Development Engagement on Sustainable Livelihoods and Food Security Programme for Refugee and Host Populations in Ethiopia	Ongoing	Denmark	Grant	0	0	0	0	22935.12202	0	0	0
Development Response to Displacement Impacts Project in the HoA	Ongoing	International Development Association	Loan	100000	7000	0	3397.523	0	19933.418	0	21982.79
Development of Next Generation Sustainable Land Management (SLM) Framework to Combat Desertification	Ongoing	JICA	Grant	0	0	3600	1597.586605	0	2304.961935	0	20.11516246

Disaster Risk Reduction (DRR)	Ongoing	United Nations Development Program	Grant	0	2627.826	0	1525.782	0	461.692	0	0
Drought Resilience and Sustainable Livelihood Program	Completed	Italy	Loan	0	6655.8	0	0	0	0	0	0
Drought Resilience and Sustainable Livelihood Project	Ongoing	African Development Bank	Loan	0	7336.599	0	2589.963	0	5748.697077	0	7265.079136
Drought Response in Ethiopia	Completed	Italy	Grant	2218.6	2218.6	0	0	0	0	0	0
Drought mitigation in Ethiopia	Completed	Italy	Grant	2115.760125	2115.4351	0	0	0	0	0	0
EU-Coffee Action for the Federal Democratic Republic of Ethiopia (EU-CAfE)	Ongoing	European Union	Grant	0	0	0	0	17989.5	0	0	4305.366971
Early Warning & Disaster Preparedness (2012-15)	Completed	United Nations Children's Fund	Grant	0	139.553	0	0	0	0	0	0
Economic Growth	Ongoing	USAID	Grant	0	1798.552	0	51.252	0	38.749	0	0
Effective Irrigation for sustainable agricultural production.	Completed	Czech Republic	Grant	0	125.293	0	118.101	0	0	0	0

Engaging the private sector in farms	Completed	CIDA Canada	Grant	0	719.1354943	0	0	0	0	0	0
Enhanced National Capacities for Livestock Sector and transformation	Ongoing	United Nations Development Program	Grant	0	0	0	382.851	2000	805.271	0	740.676
Enhancing Food Security, Nutrition and promoting participatory Agroforestry in Tigray	Completed	IRISH AID	Grant	0	0	688.805	689.39	742.68	734.04	0	674.04
Enhancing National Capacity for Agricultural growth program II	Ongoing	United Nations Development Program	Grant	0	0	0	0	600	0	0	0
Ensuring Sustainable Management of Water Resources in SNNPR (Sustainable and Potable Water Supply Project).	Ongoing	Czech Republic	Grant	0	0	0	0	5000	208.689	0	876.18
Establishment of Agricultural Technology Demonstration Center	Ongoing	China	Grant	0	114.8956164	0	0	0	0	0	0
Establishment of Sustainable Drinking Water Supply systems in Small Towns in the district zone of Sidama, SNNP Ethiopia II	Completed	Czech Republic	Grant	0	198.294	0	77.222	0	0	0	0

Establishment of Sustainable Drinking Water Supply Systems in Sidama Zone, Ethiopia, III	Completed	Czech Republic	Grant	1147.54	169.411	0	0	0	1165.182	0	0
Ethiopia Productive Safety Net Programme Phase 4(PSNP 4),2015-2020: project number: 204290	Completed	FCDO former DFID	Grant	0	99824.02238	0	67251.1624	0	62127.08249	32107.71451	54075.45468
Ethiopian Church Forest Initiative	Ongoing	Norway	Grant	0	0	0	0	0	204.2722698	0	76.988532
Ethiopian Horticulture competitiveness project	Ongoing	Netherlands	Grant	0	0	4731.278251	798.2155417	0	0	0	1426.350159
Ethiopian Somali Regional State's Capacity Building Project for Agriculture and Livestock Bureaus (A & L Capacity Building Project)	Completed	Spain	Grant	110.93	0	0	0	0	0	0	0
Ethiopian Somali Regional State's Capacity Building Project for Agricultural and Livestock Bureaus (A&L Capacity Building Project)	Completed	Spain	Grant	110.93	0	0	0	0	0	0	0
FCPF Reducing Emission from Deforestation and	Ongoing	International Developmen	Grant	0	2236.925	0	2002.428	0	3296.65	0	0

Forest Degradation Project		t Association									
Feasibility analysis - Piloting Livelihood Innovation through Livestock Business Hub Models	Ongoing	Food and Agricultural Organization	Technical assistance	0	0	0	0	0	0	260	203
Financial & system audit of Contributing to the achievement of Water and Sanitation Access Millennium Development Goals targets in rural vulnerable communities of SNNP and Oromia Region, Ethiopia - Moore Stephens	Ongoing	European Union	Technical assistance	22.1349722	11.0674861	0	0	0	0	0	0
Financial Audit of the project DCI-FOOD 2011/282576: EC livelihood support project to HABP in Southern Ethiopia	Ongoing	European Union	Technical assistance	0	26.6209814	0	0	0	0	0	0
Finland Contribution to One Wash National Program through consolidated WASH account	Completed	Finland	Grant	0	0	2157.2	559.4	0	615.2	0	1122.6
Food Sufficiency for Farmers	Ongoing	CIDA Canada	Grant	0	0	0	1594.585315	0	429.7872965	0	443.3174378

Forest Landscape Restoration	Ongoing	Norway	Grant	0	0	0	1128.23133	0	433.1003134	0	923.9463188
Four Towns Water Supply and Sanitation Improvement Program	Ongoing	African Development Bank	Loan	76100	553.67	0	154.65	0	491.5607111	0	1472.34924
GEF Grant to Community Based Integrated Natural Resource Management Project (CBINRMP)	Ongoing	International Fund for Agricultural Development (IFAD)	Grant	0	586.222	0	476.42	0	303.693	0	0
GEF for Sustainable Land Management Protect	Ongoing	International Development Association	Grant	0	1332.034	0	0	0	0	0	0
Global Environment Facility (GEF) and LDCs Fund for SLMP II	Ongoing	International Development Association	Grant	0	1322.606	0	435.445	0	2718	0	0
Global Green Growth Institute Country Program for Ethiopia 2013-2015	Ongoing	Norway	Grant	0	5350.603435	0	0	0	0	0	0
Global Network Against Food Crises Partnership Programme - Country Investment Ethiopia	Ongoing	Food and Agricultural Organization	Technical assistance	0	0	0	0	4830.918	0	0	596.815
Global Programme " Soil protection and Rehabilitation for food security"- Ethiopia country component	Ongoing	Germany	Technical assistance	0	0	963.9378392	0	4677.441925	3833.627598	0	5858.44652

"Integrated Soil Fertility Management" Project (ISFM+)											
Global Programme "Soil Protection and Rehabilitation for food security"- Ethiopia Country Component "Afar Soil rehabilitation project- ASRP- /GIZ/	Ongoing	Germany	Technical assistance	0	0	0	0	0	1856.717026	0	1415.8025
Global project Food Security and Strengthening of Resilience/GIZ/ 14.0968.9	Ongoing	Germany	Technical assistance	0	0	633.5886368	0	1735.41683	0	0	0
Green Innovations Centers in Agricultural Systems (GIA)/GIZ/ 14.0967.1-XXX	Ongoing	Germany	Technical assistance	0	0	0	0	0	5532.569702	0	5414.882329
Ground Water Irrigation Development and Rural Development Project	Ongoing	Korea/KOICA/EXIM Bank	Loan	0	0	0	0	0	0	94000	0
Health of Ethiopian Animals for Rural Development-HEARD	Ongoing	European Union	Grant	0	0	0	0	17989.5	2334.484494	0	13.1244
Horticultural Livelihoods, Innovation and Food safety in Ethiopia II (HortiLIFE II)	Ongoing	Netherlands	Grant	0	0	0	0	0	0	23022.18924	2871.790284

INTEGRATED AGRO-INDUSTRIAL PARKS SUPPORT PROJECT-PAGoDA-EU	Ongoing	African Development Bank	Grant	0	0	0	0	0	0	15000	0
Improved access to Sanitation and Hygiene Services in Addis Ababa - IASHS	Ongoing	Italy	Grant	436.0359556	0	0	64.933	0	0	0	398.4951507
Improved rural livelihoods through support to Moringa Value Chain development in SNNPR, Ethiopia	Ongoing	Italy	Grant	0	0	0	0	0	0	0	0
Improvement of agricultural production and of food security in the district of Saba Boru, Oromia, Ethiopia.	Completed	Italy	Grant	1069.892118	322.7196	0	0	0	0	0	0
Improvement of sanitation facilities in urban areas of Ethiopia	Ongoing	Italy	Grant, Loan	0	0	0	0	25304.4	0	0	1497.28588
Improving Quality of Life by Ensuring Available and Sustainable Management of Water Resources in Sidama Zone.	Ongoing	Czech Republic	Grant	0	0	0	0	1152	640.338	0	93.42
Improving Sanitary Capacity and Facilitating export of	Ongoing	Food and Agricultural	Grant	0	0	0	0	795.45	9.429	0	64.663

Livestock and Livestock products from Ethiopia		Organizatio n									
Improving access to safely managed water supply in the resilience building programme for Ethiopia	Ongo ing	European Union	Grant	0	0	5725.95 416	0	0	0	0	0
Improving and Integrating Animal Health Services in the Livestock Value Chain through Public Private Dialogue in Ethiopia (LVC/PPD)	Com plete d	European Union	Grant	0	471.9550 129	0	0	0	0	0	0
Improving smallholder livelihoods & resilience in SNNPR through climate smart Agricultural Economic Dev't	Ongo ing	IRISH AID	Grant	1442.09	1442.09	1524.77	1524.77	1295.03	1295.03	829.875	839.85
Improving the sustainability and inclusiveness of the Ethiopian Coffee Value Chain through private and public partnership	Ongo ing	Italy	Grant	1044.4	0	1010.18 9705	1086	738.936 088	970.4741 555	0	717.6903 8
Inclusive and Sustainable Value Chain Development in Oromia	Com plete d	Italy	Grant	1553.02	0	0	1503.18	0	0	0	0

Inclusive and Sustainable Value Chains Development in Oromia	Ongoing	Italy	Grant	0	345.4781319	0	0	0	0	0	0
Inclusive and Sustainable development of Agriculture Value Chain in Oromia and SNNPR	Ongoing	Italy	Loan	0	0	0	0	34614	0	0	0
Increased ecological stability of Dijo and Bilate watersheds, Ethiopia, 2016 -2018	Completed	Czech Republic	Grant	579.352	37348	0	63315	0	67175	0	0
Increasing Agricultural Productivity through Innovation (Inc. Mechanization) KfW	Ongoing	Germany	Grant	0	0	0	0	0	0	16537.5	0
Increasing agricultural productivity through innovation (incl. mechanization) (KfW)	Ongoing	Germany	Grant	0	0	0	0	0	0	16537.5	0
Institutional Strengthening for Forest Sector Development in Ethiopia	Ongoing	Austria	Grant	0	0	0	0	0	0	0	12.846
		Norway	Grant	0	0	0	0	0	285.397	0	462.733
		SIDA Sweden	Grant	0	0	0	0	0	745.912	0	916.211
		United Nations Development Program	Grant	0	423.304	0	2997.234	0	156.385	0	0

Integrated Land-use and Development Plan (ILDP)	Completed	SIDA Sweden	Grant	1003.116734	875.9767418	0	143.1574638	0	1651.097437	0	1015.586698
Integrated Livelihoods Improvement project	Ongoing	IRISH AID	Grant	0	0	0	178.02	0	174.495	0	167.97
Integrated project to improve the access to basic services for the enhancement of environmental resources in Wonchi	Ongoing	Italy	Grant	205.848053	201.743097	0	0	0	0	0	0
Integrated watershed management with climate smart agriculture in Geregera watershed	Ongoing	IRISH AID	Grant	499.185	221.86	212.6	212.6	0	300.118	287.742	287.742
Irrigation and Drainage Project	Ongoing	International Development Association	Grant, Loan	0	16417.925	0	23323.358	0	0	0	0
Kibre-Mengist Town Water Supply Project	Ongoing	Arab Bank for Economic Development of Africa (BADEA)	Loan	0	492.72	0	0	0	0	0	0
LAND-Lively Hood Agricultural and Development and National Development	Ongoing	CIDA Canada	Grant	0	827.6086162	0	14.03204861	0	56.60972562	0	0

LIVES-Livestock and Irrigation Value Chain	Ongoing	CIDA Canada	Grant	14144.48695	4366.419326	0	1953.104998	0	2468.417581	0	2177.12842
Land Investment for Transformation- Wealth Creation Programme	Completed	FCDO former DFID	Grant, Technical assistance	0	14767.11305	0	16062.40934	0	19221.9928	0	14161.49339
Libo-kemkem, Ebinat, Gaint and Simada (LEGAS) WASH Promotion Project	Ongoing	European Union	Grant	0	0	0	253.6956672	0	0	0	0
Livelihood / Risk Reduction (2019-2020)	Ongoing	World Food Programme	Grant	0	0	0	0	0	0	4800	0
Livestock and Fisheries Sector Development Project	Ongoing	International Development Association	Loan	0	0	153000	0	0	13273.263	0	18483.021
Lowland Livelihood Resilience Project	Ongoing	International Development Association	Grant, Loan	0	0	0	0	0	0	350000	0
		International Fund for Agricultural Development (IFAD)	Loan	0	0	0	0	0	0	90000	0
Lowland Livelihoods Resilience Project	Ongoing	International Fund for Agricultural Development (IFAD)	Loan	0	0	0	0	900	0	0	0

MARKET LED ECONOMIC GROWTH II	Ongoing	USAID	Grant	89512.345	91031.749	82866.857	69937.48	76448	72346.2	107305	66304.514
Mainstreaming Argo biodiversity into Agricultural Production System	Completed	United Nations Development Program	Grant	0	921.293	0	775.894	0	0	0	0
Managing the rain-improving the management of rainwater resources	Completed	Food and Agricultural Organization	Grant	0	203	0	276	0	0	0	0
Market Based Solution for Improved Livelihood	Ongoing	CIDA Canada	Grant	14144.48695	1086.762589	0	32.19164613	0	0	0	0
Mekele Water Supply Development Project	Ongoing	China	Loan	0	0	0	0	251386.5635	0	0	0
Ministry of Agriculture	Ongoing	Spain	In-kind	0	0	0	0	226.92	0	0	0
NDRMC 2016/SPE/000400126	Ongoing	Spain	Grant	0	0	0	0.5374	0	0	0	0
Natural Resource Management capacity, Including Community-Based Watershed Development (MERET PLUS)-2012-15	Completed	World Food Programme	Grant	0	464.978	0	0	0	0	0	0
NuME-Nutritious Maize	Ongoing	CIDA Canada	Grant	0	1369.673559	0	898.9945553	0	930.7863045	0	704.4631585
Omo Delta Project: Expanding the	Ongoing	European Union	Grant	0	0	14274	0	0	0	0	6127.044298

Rangeland to achieve growth & transformation - Veterinaires Sans Frontiers Germany (VSFG)											
One Village One Product (OVOP) Promotion	Ongoing	JICA	Grant	0	195.5317968	0	0	0	0	0	0
Operational Research Technologies Dissemination in SNNPR	Completed	IRISH AID	Grant	166.395	158.385	0	0	0	178.05	0	167.82
Operational research Technologies Dissemination in Tigray	Completed	IRISH AID	Grant	221.86	221.86	224.98	232.84	232.32	231.62	0	219.7
P167794 One WASH-Consolidated Water Supply Sanitation, and Hygiene Account Project (CWA)	Ongoing	International Development Association	Loan	300000	0	0	0	0	0	0	0
Participatory Development of Productive landscapes in Sidama zones, SNNPR, Ethiopia.	Ongoing	Czech Republic	Grant	0	0	904.6	0	0	205.7	0	279.386
Participatory Small-Scale Irrigation Development Project	Ongoing	International Fund for Agricultural Development (IFAD)	Grant, Loan	0	763.906	0	0	0	0	0	10785.603

Partnership for Capacity Development in Sustainable Infrastructure Development and Water Resources Protection in Oromia Region, Adama and Bishoftu towns, Ethiopia	Ongoing	European Union	Grant	0	0	0	0	0	460.7874072	0	0
Pastoral Community Development Project Phase Three (PCDP III)	Ongoing	International Fund for Agricultural Development (IFAD)	Loan	0	34219.775	15000	27977.422	28900	34307.982	0	8363.874
Preservation of Soil and Water Resources to Improve Drought Resilience and Food Security in the Arid and Semi-Arid Regions of Eastern Ethiopia- (BMZ Nr. 2015 01 360)	Completed	Germany	Grant	0	0	0	5667.249958	0	121.85	0	638.212224
Productive Safety Net Program (PSNP) (2019-2020)	Ongoing	World Food Programme	Grant	0	0	0	0	0	0	42843.04	14195.72
Productive Safety Net Program (PSNP) Contingency Budget Line Via the building resilience in Ethiopia	Ongoing	FCDO former DFID	Grant, Technical assistance	0	0	32989.31588	86354.34077	37678.70148	76986.54007	53553.34203	94586.50272

Productive Safety Net Program: PSNP IV	Completed	IRISH AID	Grant	11536.72	11536.72	12542.4	12542.4	11817.52	11785.28	11128	11095
Productive Safety Net Program Phase 4	Completed	Austria	Grant	2218.6	2218.6	0	0	0	0	0	0
Productive Safety Nets Program IV (PSNP IV)	Ongoing	Denmark	Grant	0	0	0	7964.726584	0	0	0	0
		International Development Association	Grant, Loan	100000	315266.63	108000	221806.65	0	0	0	0.899
		Netherlands	Grant	0	0	0	9360	0	7778	0	14117.647
Programme for the socio-economic development and job creation for youth and women in regions with a high incidence of migration	Ongoing	Italy	Grant	0	0	0	0	292.6	271.24875	269.82375	264.88375
Project for Enhancing Development and Dissemination of Agricultural Innovation through FRGS	Ongoing	JICA	Grant	0	2.538470774	0	34.74047978	0	72.21785183	0	0
Project for Functional Enhancement of the National Rice Research and Training Center	Ongoing	JICA	Grant	0	0	0	625.1736332	0	1593.450981	0	402.0488568

Project for Smallholder Horticulture Farmer Empowerment through Promotion of Market-Oriented Agriculture (Ethio-SHEP)	Ongoing	JICA	Technical assistance	0	0	498.4636207	0	0	0	0	0
Project for Water Supply Development with Solar Tandem Pump System in Tigray Regional State	Ongoing	JICA	Grant	0	0	0	0	1788.242489	0	0	0
Project for ground Water Resource Assessment in the Middle Awash River Basin	Ongoing	JICA	Technical assistance	0	688.5028213	0	0	0	0	0	0
Project for sustainable Natural Resource Management through FFS in the Rift Valley Area of Oromia Region	Ongoing	JICA	Technical assistance	0	956.292429	0	271.644616	0	540.8098455	0	0
Promote rural development and food security in the regions and SNNPRS Oromia, Ethiopia (PSRSA)	Completed	Italy	Grant	0	0	0	145.6327	0	0	0	0
Promoting inclusive urban development in Assosa town, Ethiopia	Ongoing	European Union	Grant	0	0	0	0	0	0	0	2317.399826
Promotion of Sustainable Ethiopian Agro-industrial	Ongoing	European Union	Grant	0	0	0	0	51169.5	0	0	29956.27575

development (PROSEAD)											
Protracted Relief and Recovery Operations Ethiopia 200712	Completed	World Food Programme	In-kind	772527.332	368553.196	0	194368.886	0	4044.532	0	1971.559
Provision of Adequate Tree Seed portfolio	Ongoing	Norway	Grant	0	0	0	1477.631023	0	595.3262156	0	1766.417064
Purchase for Progress (P4P)	Completed	World Food Programme	Grant	0	645.738	0	0	0	0	0	0
Pursuing pastoral Resilience (PPR) through improved animal health service delivery in pastoral areas of Ethiopia.	Ongoing	Food and Agricultural Organization	Grant	0	948	0	2875.513	0	4968.586	0	2092.134
RURAL WASH IN Oromia	Ongoing	Italy	Grant	0	0	0	0	0	0	0	0
Reducing Food Losses through Improved Post-harvest Management in Ethiopia Phase I	Completed	Food and Agricultural Organization	Grant	0	547	0	454.938	0	815.396	0	0
Reducing Food Losses through Improved Post-harvest Management in Ethiopia Phase II	Ongoing	Food and Agricultural Organization	Grant	0	0	0	0	2908.726	343.691	0	1065.582
Regional Pastoral Livelihoods Resilience Project	Ongoing	International Development Association	Loan	0	2434.686	0	2095.627	0	15766.461	0	69633.12

Research in the Areas of Food Security and Nutrition	Completed	Germany	Technical assistance	0	0	2329	0	0	0	0	0
Research to Improve Drought Tolerance in Ethiopia	Ongoing	Germany	Technical assistance	0	0	480.9385	0	0	0	0	0
Resilience-Boosting Through WASH for Shalla (ReWASH)	Ongoing	Austria	Grant	0	0	15.774	0	0	0	0	0
Resilient Landscapes and Livelihood Project (RLLP)	Ongoing	International Development Association	Loan	0	0	0	0	100000	0	0	21026.44
Resilient Landscapes and Livelihoods Project	Ongoing	Norway	Grant	0	0	0	0	21735.66326	0	0	923.9206818
Responsible and Innovative Land Administration in Ethiopia	Completed	Finland	Grant	0	3854.019253	0	1754.176828	0	0	0	0
Rural Development	Ongoing	Czech Republic	Grant	0	0	0	0	0	0	5000	414.584
Rural Development Strategy and Model Village Consulting Project in Amhara Region	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	0	4000	679	0	260.3	0	1695.743

Rural Financial Intermediation Project (RUFIP II)	Ongoing	International Fund for Agricultural Development (IFAD)	Grant, Loan	0	5873.424	0	2851.753	0	621.458	0	984.925
Rural Productive Safety Net Project (RPSNP)	Ongoing	International Development Association	Grant	0	0	600000	156219.065	0	69061.84	0	229712.3
Rural Resilience Enhancement Project (RREP)	Ongoing	JICA	Grant	0	760.6162554	0	0	0	0	0	0
Rural capacity Building program	Completed	CIDA Canada	Grant	0	0	0	2331.17148	0	0	0	0
Rural poverty reduction through job creation in small ruminant value chains in Ethiopia highlands	Completed	Food and Agricultural Organization	Grant	0	50	0	397.072	0	332.982	0	0
SANITATION DAILY: Hygiene & Sanitation Improvement Project	Ongoing	European Union	Grant	0	673.1354423	0	0	0	0	0	0
SNSF+TA	Ongoing	CIDA Canada	Grant	0	0.455429594	0	0	0	0	0	0
SUGAR INDUSTRY DEVELOPMENT I	Ongoing	India	Loan	0	833.308	0	294.59	0	0	0	0
SUGAR INDUSTRY DEVELOPMENT III	Ongoing	India	Loan	0	11065.293	0	5477.14	0	66.873	0	0

SUGAR INDUSTRY DEVELOPMENT IV	Ongoing	India	Loan	0	1389.037	0	4192.38	0	0	0	0
SUGAR INDUSTRY DEVELOPMENT iv SECOND PHASE	Ongoing	India	Loan	0	7425.31	0	2236.96	0	1274.53	0	0
Safety Net Programme IV	Completed	Netherlands	Grant	3314	8303.027	0	24452.788	0	0	0	0
Sanitation & Hygiene (2020-2025)	Ongoing	United Nations Children's Fund	Grant	0	0	0	0	0	0	0	0
Scaling-up Community-Based Nutrition (CBN) and hygiene intervention in Amhara and SNNP Regions through strengthened inter-sectoral collaboration for optimal nutrition outcomes.	Completed	Food and Agricultural Organization	Grant	0	503	0	2355.296	0	181.455	0	0
Seed of future – Integrated intervention to fight malnutrition	Ongoing	Italy	Grant	0	0	0	0	0	0	568.519128	193.3677348
Small Scale and Micro Irrigation Support Project	Completed	Netherlands	Grant	0	3327.9	0	2520.78	0	1626.235696	0	1177.561614
Small and Medium towns Nutrition (Water Supply and Sanitation	Ongoing	European Investment Bank	Loan	0	5200	0	0	0	0	0	0

Improvement Programme											
Spanish Contribution for AGP	Completed	Spain	Grant	0	0	0	1184.9	0	1140.8	0	0
Strategic Analysis, Research and Evaluation Fund	Completed	FCDO former DFID	Grant	0	2032.727368	0	99.44521982	0	479.187254	0	1520.49979
Strategic Climate Institutions Programme	Completed	FCDO former DFID	Grant	0	294.6062872	0	0	0	0	0	0
Strengthening Implementation of Yayu Coffee Forest Biosp	Completed	Austria	Grant	0	0	0	78.144396	0	0	0	0
Strengthening Institutionalized subnational coordination structures and harmonization mechanisms	Completed	Food and Agricultural Organization	Grant	0	97	0	825.015	0	1129.262	0	643.22
Strengthening Livelihoods and Nutrition through Improved Community Services in Sidama and Gedeo zones, SNNPR, Ethiopia	Ongoing	Czech Republic	Grant	0	0	515.7	0	0	150.7	0	110.868
Strengthening Sustainable Livelihoods and Forest Management in Ethiopia	Ongoing	European Union	Grant	0	28.9826811	0	0	0	0	0	0

Strengthening climate resilient systems for water, sanitation and hygiene services in Ethiopia (SCRS-WaSH)- PROJECT NUMBER: 300237	Ongoing	FCDO former DFID	Grant, Technical assistance	0	0	0	0	0	0	116791.2343	25771.78058
Strengthening of Fruit and Cactus Pear Production in Tigray and North Wello	Completed	Food and Agricultural Organization	Grant	0	296	0	70	0	0	0	0
Strengthening the role of women for water, hygiene, and community development in SNNPR	Ongoing	Italy	Grant	0	0	0	132.253	0	144.06275	0	0
Support Wetabmo Gebe Primary School in School Garden Farming for Production of Vegetables & Crops	Ongoing	Food and Agricultural Organization	Technical assistance	0	0	0	0	8.5	0	0	4.391
Support for Establishing Web-based National Irrigation Database and Water Management Information System (MIS) for Ethiopia	Ongoing	Food and Agricultural Organization	Grant	0	0	0	0	497	0	0	106.769
Support of Agricultural Consultancy Development in Ethiopia	Completed	Czech Republic	Grant	0	57.182	0	0	0	0	0	0

Support of Farmers and Agricultural Education in Alaba Woreda	Completed	Czech Republic	Grant	0	16.569	0	0	0	0	0	0
Support the Government of Ethiopia in Reviewing Comprehensive Agriculture and Rural Development Policy	Ongoing	Food and Agricultural Organization	Grant	0	0	0	0	0	0	0	0
Support to ATA's Agricultural Growth Program	Completed	Netherlands	Grant	0	2124.786	0	0	0	0	0	0
Support to Community-Led Accelerated WASH in Ethiopia (CoWASH I & II)	Completed	Finland	Grant	0	4002.843601	0	0	0	0	0	0
Support to Livelihoods of drought affected household's and resilience building of Vulnerable groups in Warder and Kebredahar Woredas of Ethiopia's Somali region	Ongoing	Austria	Grant	0	0	0	0	0	242.937	0	738.721
		United Nations Development Program	Grant	0	0	0	0	1867.774	46.912	0	559.93
Support to WaSH Sector in Urban areas (WASH basket fund initiative)	Ongoing	France	Grant	0	3327.9	0	0	0	580.55	0	0
		Italy	Grant, Loan	0	5381	0	0	0	0	0	0
Support to livelihood of drought affected household and resilience building in	Ongoing	Austria	Grant	0	0	356.55	0	0	17770.189	0	65.916

Warder and Kebridahar woredas of Ethiopia's Somali Region											
Support to the Agricultural Growth Programme - Phase II (AGP II) and complementary Action to Promote Nutrition into AGP – II	Ongoing	European Union	Grant	48253.5	0	0	0	0	45407.45	0	0
Support to the Productive Safety Nets Programme - Phase IV	Completed	European Union	Grant	0	16015.65	0	2.6229659	0	35.795654	0	0
Support to the Sustainable Land Management Programme (SLMP - Phase II) of Ethiopia	Ongoing	European Union	Grant	21446	1447.704476	0	1116.36	0	3240.330513	0	127.1437691
Supporting sustainable Agricultural Productivity (SSAP)	Ongoing	Germany	Technical assistance	0	0	6404.75	0	0	1689.627472	0	2037.604768
Supporting sustainable Agricultural Productivity (SSAP) 2	Ongoing	Germany	Technical assistance	0	0	5589.6	0	0	0	0	0
Supporting the Government of Ethiopia in navigating REDD+ readiness and designing a model for regional REDD+ under the	Ongoing	Norway	Grant	0	0	0	0	0	0	0	430.063
		United Nations Development Program	Grant	0	0	0	0	200	0	0	536.951

UNFCCC Warsaw Framework.											
Sustainable Agricultural Growth through Irrigation (Capacity Building for Sustainable Irrigation and Agriculture)	Ongoing	CIDA Canada	Grant	0	2695.684263	0	3525.623546	0	2736.038339	0	1489.739542
Sustainable Land Management Programmes (SLM IV) (KfW)	Ongoing	Germany	Grant	0	0	0	0	0	0	20206.8	0
Sustainable Land management Project (phase II)	Completed	Norway	Grant	0	7292.962337	0	7028.520986	0	0	0	0
Sustainable Water Supply for Itang Community in Gambella	Completed	Italy	Grant	0	476.999	0	0	0	0	0	0
Sustainable technologies to provide drinking water and improve energy efficiency of rural communities in 8 Woreda of Ethiopia - WASH-UP	Ongoing	Italy	Grant	0	0	0	0	0	0	1474.912504	476.9903419
TRANSLATING WATER MANAGEMENT POLICY INTO IMPACT –	Ongoing	SIDA Sweden	Grant	0	0	0	1100.964262	0	0	0	507.7933491

STRENGTHENED GOVERNANCE ARRANGEMENTS AT BASIN LEVEL 2017-2020											
Tana and Beles Integrated Water Resource Development Project	Ongoing	International Development Association	Loan	0	654.652	0	0	0	0	0	0
Technical Assistance to Inclusive and Sustainable Value Chain Development in Oromia and SNNP regions	Ongoing	Italy	Grant	0	0	0	0	4655.6	1141.6	0	0
Technical Assistance to the Second Agricultural Growth program (TA-AGP-II)	Ongoing	Food and Agricultural Organization	Grant	0	0	0	0	3000	0	0	528.713
Technical Support for Agricultural Growth programme	Completed	Food and Agricultural Organization	Grant	0	645	0	305	0	0	0	0
Techno serves - Mejang Livelihoods Project Phase 22017-2018	Ongoing	SIDA Sweden	Grant	1637.682651	0	0	1226.234647	0	550.5093543	0	0
Teff Mechanization Key Equipment and Technology Promotion	Ongoing	China	Grant	0	0	0	0	56319	0	0	0

The Climate Resilient Forest Livelihoods Programme	Ongoing	Denmark	Grant	0	0	0	0	6880.536607	0	0	144.7715957
The Co-operation in Programme for Agro Business Induced Growth in the Amhara National Regional State, phase II 2017-2021	Ongoing	Finland	Grant	0	0	10726.76646	480.4363891	0	2784.941756	0	2838.061952
The Cooperation in Support to Community-Led Accelerated Wash in Ethiopia, Phase III (2016-2019) (CoWASH III)	Ongoing	Finland	Grant	12202.3	971.4905517	0	4325.576606	0	3802.283106	4526.614928	3899.027969
The Project for Smallholder Horticulture Farmer Empowerment Through Promotion of Market-Oriented Agriculture (Ethio-SHEP)	Ongoing	JICA	Technical assistance	0	0	498.4636207	416.5222048	0	1002.304314	0	93.75264741
The Project for Development of Next Generation Sustainable Land Management (SLM) Framework for Combat Desertification	Ongoing	JICA	Technical assistance	0	0	3577.080719	0	0	0	0	0
The Project for Functional Enhancement of	Ongoing	JICA	Technical assistance	0	0	0	0	0	942.6268407	0	0

National Rice Research and Training Center											
The Project for Improvement of Water Supply, Sanitation and Hygiene in Gurage Zone, SNNPR	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	456.1	0	3007.9	0	94.614	0	757.935
The Project for Rural Water Supply, sanitation and livelihood Improvement through Dissemination of Rope Pumps (RPS) for Drinking Water	Ongoing	JICA	Technical assistance	0	1469.957419	0	465.4799287	0	0	0	0
The Project for Strengthening Capacity for training operation and management for Ethiopian Water Technology Institute (EWTI)	Ongoing	JICA	Technical assistance	0	130.6881957	2714.963797	135.1409915	0	814.0258059	0	637.0891697
The Project for Water Supply in Bahir Dar City	Ongoing	JICA	Technical assistance	0	0	16308.83407	0	0	0	0	0
The Project for Strengthening of Agricultural Pesticide Residue Analysis System	Ongoing	JICA	Technical assistance	0	534.4755039	0	149.8202097	0	0	0	0

The Second Phase of Drought Resilience and Sustainable Livelihood Project (DRSLP II)	Ongoing	African Development Bank	Loan	0	1499.781	0	3031.557	0	4355.62797	0	7617.753151
The Second Phase of Participatory Small-scale Irrigation Development Programme (PASIDP II)	Ongoing	International Fund for Agricultural Development (IFAD)	Grant, Loan	114500	0	0	19230.979	0	17707.043	0	9115.36
The Second phase of Agricultural Growth Project (AGP II)	Ongoing	International Development Association	Grant, Loan	0	44905.508	0	63017.135	27000	52880.98	0	23414.28
		Netherlands	Grant	0	5434.783	0	0	0	0	0	5434.783
The Second phase of Urban Water Supply and Sanitation Project (UWSS II)	Ongoing	International Development Association	Loan	0	0	445000	0	0	37620.67	0	23798.83
The co-operation in responsible and innovative land administration project, phase II 2017-2021	Ongoing	Finland	Grant	0	0	7962.65	604.7159895	0	1467.060595	0	1988.438436
The project for improvement of water supply in Bahir Dar city	Ongoing	JICA	Grant	0	0	17200	0	0	160.9127417	0	0
The second Phase of Water Supply, Sanitation and Hygiene (WASH II)	Ongoing	African Development Bank	Grant, Loan	0	14564.793	5620	16588.226	0	15265.46453	0	16442.92541

The third phase of Pastoral Community Development Project (PCDP III)	Ongoing	International Development Association	Loan	0	37908.936	0	34168.096	0	1565.598	0	21.55
Towards sustainable and inclusive Riverside Development in Addis Ababa Municipality.	Ongoing	United Nations Development Program	Grant	0	0	0	0	0	0	1000	33.53
UN-Habitat Country Programme 2018-2020: Promote Sustainable Cities	Ongoing	SIDA Sweden	Grant	0	0	0	0	3114.903299	1920.693756	0	600.6572673
UNHCR-FAO Partnership for Comprehensive Value Chain Analysis of Ethiopia's Refugee Hosting Areas to Inform Joint Projects for Agriculture and Livestock	Ongoing	Food and Agricultural Organization	Grant	0	0	0	0	0	0	445.41	2.14
Upgrade of Water Supply in Refugee Camps and Host Communities	Completed	Germany	Grant	0	0	3493.5	0	0	0	0	0
Urban Water Supply Sanitation Project	Ongoing	International Development Association	Grant, Loan	0	0	0	41050.95	0	1021.157	0	0

Village Cooperative Capacity Building Project	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	0	0	0	0	0	47.41821986	78.14020718
WACCA Ethiopia - WATER AND CLIMATE CHANGE SERVICES FOR AFRICA: A programme to strengthen the development of climate and water information services in Ethiopia 2017-2020	Ongoing	SIDA Sweden	Grant	0	0	0	1177.715655	0	0	0	407.225266
WATSAM Support to Arba Minch Town water utility and Municipality in the water & sanitation sector through capacity building and partnership development with Italian water organizations	Ongoing	European Union	Grant	0	61.8534587	0	0	0	0	0	0
Waste Management - Sendafa Sanitary Landfill - Addis Ababa	Completed	France	Loan	0	4441.135796	0	0	0	0	0	0
Water Supply (2012-15)	Completed	United Nations Children's Fund	Grant	0	17626.894	0	0	0	0	0	0

Water Supply (2016-2020)	Completed	United Nations Children's Fund	Grant	11905.293	18695.046	10355.311	38316.348	8940.62	27251.247	4703.636	11553.056
Water Supply and Sanitation Project II	Ongoing	International Development Association	Loan	0	28090.968	0	36156.041	0	27666.845	0	42384.07
Water Supply (2020-2025)	Ongoing	United Nations Children's Fund	Grant	0	0	0	0	0	0	0	0
Water and Land Resource Phase III	Completed	Switzerland	Grant	1602.757289	0	0	0	0	0	0	0
Water for Food Security, Women's Empowerment and Environment SWEEP	Ongoing	Austria	Grant	0	0	3287.76	0	0	1179	0	1011.59
Water, Sanitation and Hygiene (One WASH) Programme	Completed	FCDO former DFID	Grant	0	33556.41695	0	30107.25327	0	13406.33799	0	1155.879186
Water, Sanitation and Hygiene (WASH) National Program	Ongoing	Korea/KOICA/EXIM Bank	Grant	0	0	0	0	0	0	7000	1000
Water, Sanitation and income generation	Ongoing	Finland	Grant	0	0	24.3372384	24.273924	0	0	0	0
Water, Sanitation, Basic Infrastructure and Hygiene Promotion for Pastoralist and Agro-	Ongoing	European Union	Grant	0	0	0	601.7460603	0	0	0	0

Pastoralist Population in the Somali Regional State of Ethiopia											
Water, sanitation and education in Kaffa zone, SNNPR	Completed	Italy	Grant	0	0	0	0	0	47.8265	0	0
emergency Livestock response to drought affected pastoral and ago pastoral communities in Ethiopia	Ongoing	Food and Agricultural Organization	Technical assistance	0	0	0	0	2229.655	0	0	954.399
productive Safety Net Programme	Ongoing	Denmark	Grant	0	0	15913.64046	0	0	0	0	0
the project for improvement of water supply in Bahir Dar city	Ongoing	JICA	Grant	0	0	16308.83407	0	0	0	0	0
Report Totals (344)				1974483.045	1467151.504	1673941.741	1456908.044	1119671.258	889143.8152	1649497.722	1186996.291

Source: Ministry of Finance