

Ethiopia Country Climate Risk Assessment Report



*Irish Aid, Resilience and Economic Inclusion Team,
Policy Unit*

February, 2018



Irish Aid

Rialtas na hÉireann

Government of Ireland

For more information on Irish Aid climate change work, refer to <https://www.climatelearningplatform.org/> or contact the climate change team;

Michelle Winthrop - Climate Change and resilience Policy Lead
michelle.winthrop@dfa.ie +353 (0) 61774052

Tracy C. Kajumba - Regional Senior Climate Change &
Development Advisor Tracy.Kajumba@dfat.ie +256 417 713414

Sarah McIvor -Resilience Advisor
sarah.mcivor@dfa.ie +353 61 77 4040

Table of Contents

List of Acronyms.....	4
Executive Summary	5
1.0 Country Context.....	7
2.0 Current and future climate scenarios for Ethiopia.....	8
2.1. Current Climate Trends.....	8
2.2. Future Climate projections	9
2.3. Green House Gas (GHG) Emissions for Ethiopia.....	10
3.0. Climate change hazards, Impacts and Vulnerability.....	13
3.1 Social Economic Vulnerability due to climate change	14
3.2. Climate change impacts on Agriculture and Food Security	16
3.3. Climate Change impacts on health and Nutrition	17
3.4. Climate change impacts on the environment	18
3.5. Climate change impacts on water resources	19
3.6. Climate Change, Poverty and Inequality	20
3.7. Gender inequality and Climate change.....	21
3.8. Economic Impacts of climate change	22
4.0. Climate change policy Framework.....	23
4.1. Key Climate change policies and priority sectors	24
4.1.1. NDC Implementation progress.....	25
4.1.2. Progress on National Adaption Plan (NAP).....	26
4.2. Institutional Coordination for climate change in Ethiopia	26
4.3. Policy and Institutional Gaps for Climate Change Mainstreaming	28
5.0. Climate change financing for Ethiopia	29
5.1. Ireland’s contribution to climate finance	31
6.0 Donor Coordination and support in Ethiopia.....	32
7.0 Ireland’s Approach to Climate Change Adaptation.....	33
7.1. Irish Aid climate change programming in Ethiopia	37
8.0 Climate change implications for country development programming.....	40
References	42

List of Acronyms

AfDB	African Development Bank
AFOLU	Agriculture, Forestry and other Land Use
COFs	Climate Outlook Forums
CRGE	Climate Resilient Green Economy Strategy
DFID	The Department for International Development –United Kingdom
DNA	Designated National Entity
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
ENRM	Environment and Natural Resource Management
ENSO	El Niño Southern Oscillation
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
GCF	Global Climate change Fund
GCM	General Circulation Models
GDP	Gross Domestic Product
GHGs	Green House Gases
HDI	Human Development Index
IIED	International Institute for Environment and Development
INDC	Intended Nationally Determined Contribution
INFORM	Index for Risk Management
IPCC	Inter-governmental Panel in Climate change
ITCZ	Inter-tropical Convergence Zone
LDCF	Least Developed Countries Fund
LGAs	Local Government Authorities
LUCF	Land use Change and Forestry
M&E	Monitoring and Evaluation
MAM	March, April & May
MEFCC	Ministry of Environment, Forests, and Climate Change
MoFEC	Ministry of Finance and Economic Cooperation
MPI	Multi-dimensional Poverty Index
NAMAs	Nationally Appropriate Mitigation Actions (NAMAs).
NAP	National Adaptation Plan
NAPA	The National Adaptation Programme of Action
NDC	Nationally Determined Contribution
ND-GAIN	The Notre Dame Global Adaptation Initiative
NEPAD	New Partnership for Africa's Development
NGO	Non-Government Organisation
NIE	National Implementing Entity
NOAA	National Oceanic and Atmospheric Administration
ODA	Official Development Assistance
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
PSNP	Productive Safety Net Programme
SP	Social Protection
UNDP	United Nations Development Programme
UNFCCC	United nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WHO	World Health Organization
WMO	World Meteorological Organization
WRI	World Resource Institute's

Executive Summary

Ethiopia is the second most populous country in Sub-Saharan Africa, also one of the world's poorest countries. High economic growth and enhanced pro-poor investments have helped reduce poverty in both urban and rural areas, however, because of high population growth, the absolute number of the poor has remained largely unchanged over the years.

Climate variability has increased in Ethiopia, associated with the El Niño Southern Oscillation (ENSO), with warm phases associated with reduced rainfall in the main wet seasons causing severe drought and famine, but also with enhanced rainfalls in some months. Ethiopia's future projections from different models are broadly consistent, indicating increases in annual rainfall, which will lead to incidences of floods. The mean annual temperature has increased by 1.3°C between 1960 and 2006 and is projected to increase by 1.1 to 3.1°C by the 2060s, and 1.5 to 5.1°C by the 2090s. With continued warming and variability in rainfall, extreme events are likely to increase requiring effective adaptation planning.

Climate change studies show that cyclic hazards are already increasing, making the poor more vulnerable. Due to climate change as well as additional human induced factors, the areas affected by drought and desertification are expanding in the country. According to the Index for Risk Management, Ethiopia is ranked as high risk, with exposure to hazards including increase in floods, earthquakes and droughts respectively, which will increase conflict risk and human exposure. Vulnerability is high in relation to displaced and vulnerable people with major impacts on development, which will require strong climate governance and institutional capacity to foster adaptation and resilience to climate impacts.

Climate change and resultant disasters have continued to reverse the development trends. Drought has tested the resilience of Ethiopia not only in providing for its own population, but also planning for refugees. From a poverty perspective, climate change impacts are projected to slow down economic growth and make poverty reduction more difficult. The effects of extreme climate events are putting greater pressure on the rural poor women farmers and livestock herders. Agricultural outputs are projected to fall while agricultural commodities prices increase. It is estimated that adapting to climate change in the areas of agriculture, energy provision and road infrastructure may cost an annual average of \$0.8-2.8 billion USD. If further irrigation development is not undertaken, the country will lose between US\$28 billion and US\$32 billion by the year 2050. This is about 40% of the GDP. Renewed efforts will be necessary to buffer the economy from more frequent and/or severe climate shocks

In 2011 the government of Ethiopia finalised its "Climate-Resilient Green Economy" (CRGE), strategy, the first of its kind in Africa. The CRGE has been a master plan, drawing from previous policies and linked to the Growth and Transformational Plan (GTP II). There are other climate relevant policies and strategies focusing on addressing climate change adaptation and mitigation. The GTP II acknowledges that in the long term, if climate change is not tackled, growth itself will be at risk. Whereas Ethiopia's CRGE is strong on mitigation, the adaptation (or climate resilience) part of the strategy has developed more slowly and needs to be enhanced so as to secure the livelihoods of those most vulnerable to climate change. The federal level structural and institutional capacity needs to be replicated at regional level to effectively discharge the national climate policy implementation at all levels. The institutional

arrangements established by the CRGE strategy points to how government will administer the national response to climate change but needs to be actualised through development plans and budgets and also measured to ascertain programme effectiveness in relation to enhancing climate change resilience and green growth for Ethiopia in measurable terms

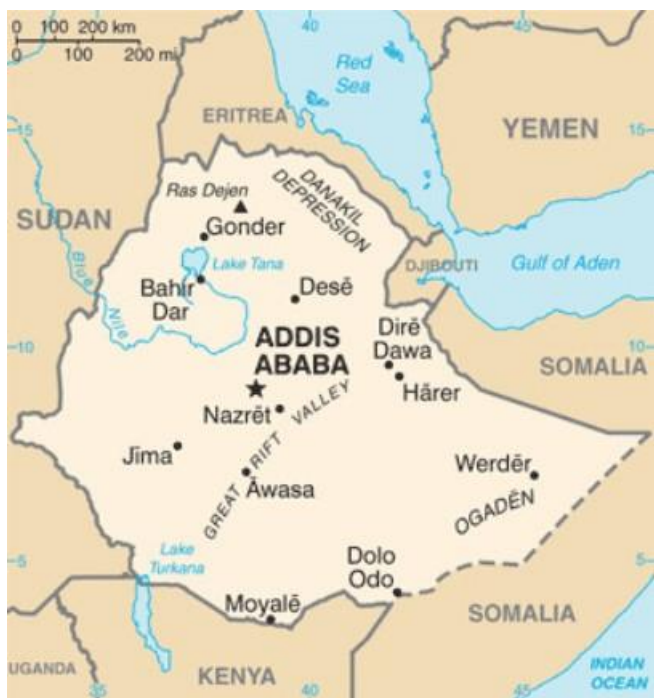
The Irish Aid Country Strategy for Ethiopia for 2014-2018 aims to support Ethiopia's growth and poverty reduction plans so that the poor benefit from, and contribute to, equitable economic, social and environmental development. The key outcomes focus on increasing household's resilience to economic, social, and environmental stresses and shocks. Irish Aid's theory of change is hinged on support that includes relief, climate-smart public works, social transfer systems and enhanced livelihoods for a sustained reduction in vulnerability and to provide the platform from which poor people can benefit and participate in economic growth. The provision of social protection-based safety nets is effectively a precondition for the type of risk taking and investment needed to build livelihoods. Ireland supports climate change through its bilateral aid and civil society programmes. In 2016, Ireland provided a total of € 14,178,725 to Ethiopia in climate finance through the bilateral programme and € 1,886,257 through civil society programme.

The following are the key recommendations to strengthen climate integration into development planning given the climate context of Ethiopia;

- Strengthening of weather and climate services and improving use of agro meteorological services with focus on short term and long term time scales to guide planning and investment. Investment in generating and disseminating accurate, timely and reliable weather and climate information will be important to inform different sector adaptation and climate risk management plans and decisions regarding changes in climate.
- There is need to strengthen early warning systems for climate variability and change as well as resultant disasters. Exploring weather index based insurance schemes as part of climate risk management and reducing loss and damage will buffer development investments and livelihoods in the long run.
- Reduce emissions through focus on a low carbon development path as well as adaptation co benefits, while addressing climate risks and focusing on inclusive economic models that can increase incomes for the poor, especially women and the youth who are engaged in high emission sectors including agriculture, livestock and forestry.
- Strengthening livelihood options and income diversification for the poor will be important to build capacity and resilience against more intense climate-related risks. Support to growth of agro-processing industries through direct support for technology transfer, capacity building and finance to strengthen production capacities in the private sector and small scale producers
- Capacity building and strengthening of Government structures at national and sub national levels to better analyse and anticipate risks will be important to improve sustainable development, planning for uncertainties, managing risks and reducing vulnerabilities resulting from climate change and disaster impacts.
- Development programmes should systematically integrate climate change adaptation and support complementary livelihood and adaptation goals as well as promote environmental protection measures such as soil and water conservation among others
- Gender analysis should be done across all climate change adaptation programmes to understand the different capacities and vulnerabilities of women and men, boys and girls and ensure they are participating in climate decision making and that their vulnerabilities are reduced.

1.0 Country Context

Ethiopia is the second-most populous country in Sub-Saharan Africa with an estimated population of 99.873,000¹ million, and population growth rate of 2.5% (2015), 80% of whom live in rural areas.² Geographically, Ethiopia is a landlocked country covering 1,104,300 km² (426,372 sq miles) with extreme climatic diversity ranging from equatorial rainforest in the south, to the desert-like conditions in the northeast.³ Ethiopia has a diverse topography, with elevations ranging from 126m below sea level and mountains exceeding 4,500 m. The majority of Ethiopia's population inhabits rural highland areas, due in part to greater rainfall.



Population, 2017;	99.873,000
Land Area;	1,104,300 km ²
Total Fertility Rate 2016;	4.043 children/woman
Life Expectancy 2017;	65.571 years (male & female)
GDP per capita (\$) 2016;	1,734.918
HDI, 2015;	174 th out of 188
GNI Per capita 2016;	660
Co2 emissions per capita;	0.119

One of the world's oldest civilizations, it is also one of the world's poorest countries. The country's GDP per capita⁴ income of \$1,734.918⁵ is substantially lower than the regional average. The government aspires to reach lower-middle income status by 2025. The expansion of services and the agricultural sector account for most of this growth, while manufacturing performance is relatively modest. Private consumption and public investment explain demand-side growth, with the latter assuming an increasingly important role in recent years. With a significantly agriculture based economy,⁶ it is not surprising that in today's technologically thriving world, Ethiopia has one of the lowest incomes per capita. Its reliance on domestic investment restricts foreign investment, which could otherwise account for a comparatively successful economy. According to International Monetary Fund (IMF) 2016 country report, Ethiopia's macroeconomic outturn during the past year 2015/16 has been adversely affected by a severe drought and the weak global environment. As a result, output growth is estimated to have slowed down in 2015/16 to 6.5 percent. A supplementary budget helped address the social costs of the

drought, while keeping the general government deficit at 3 percent of GDP. Over the medium-term, growth is projected to recover to within the 7.3-7.5 percent range, reflecting the growth-oriented reforms envisaged in the recently adopted second Growth and Transformation Plan (GTP II).

¹ UN World Population Prospects, 2017

² World Bank, "Ethiopia: Economic Overview." Accessed May 20/07 2017

³ Federal Democratic Republic of Ethiopia, Ministry of Environment and Forests (2016)

⁴ GDP per capita is based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates

⁵ World Bank, 2016. International Comparison Program data base

⁶ <https://www.cia.gov/library/publications/the-world-factbook/fields/2048.html>

High economic growth and enhanced pro-poor investments have helped reduce poverty in both urban and rural areas. Since 2005, 2.5million people have been lifted out of poverty, and the share of the population below the poverty line fell from 38.7 per cent in 2004/05 to 26 per cent in 2012/13 (using a poverty line of US\$0.60/day). However, because of high population growth, the absolute number of the poor (about 25 million) has remained largely unchanged over the past fifteen years (UNDP, 2015). Ethiopia ranks 174th out of 188 countries in the latest UNDP 2017 Human Development Report. Ethiopia's Human Development Index (HDI) value for 2015 is 0.448, which put the country in the low human development category.

The government is currently implementing the second phase of its Growth and Transformation Plan (GTP II) which runs from 2015/16 to 2019/20, aiming to continue improvements in physical infrastructure through public investment projects and transform the country into a manufacturing hub. The overarching goal is to turn Ethiopia into a lower-middle-income country by 2025. Growth targets are comparable to those under the previous plan, with annual average GDP growth of 11%; in line with the manufacturing strategy, the industrial sector is slated to grow by an average of 20%. The main challenge however, will be sustaining positive economic growth and accelerating poverty reduction, which will require significant progress in job creation, and the continued implementation of improved governance practices. The government is already devoting a very high share of its budget to pro-poor programs and investments (World Bank, 2017)

Reducing vulnerability to climate change risks and shocks as well as increasing adaptive capacity will be key for Ethiopia as climate related disasters increase. The GTP II acknowledges that in the long term, if climate change is not tackled, growth itself will be at risk. The Intended Nationally Determined Contribution (INDC 2015) of the Federal Democratic Republic of Ethiopia states that the long-term adaptation goal is to fully integrate adaptation into development activities and to do so using a process that involves affected populations, particularly pastoralists and farmers, and address vulnerabilities of women, children, elderly, the disabled, and those who are environmental refugees.

2.0 Current and future climate scenarios for Ethiopia⁷

Farmers and pastoralists in Ethiopia experiences three major seasons, February to May (FMAM) (short rainy season, or Belg), June to September (JJAS) (main rainy season, or Kiremt), and October to January (ONDJ) (dry season, or Bega) (Korecha, D.2014). Rainfall is already highly variable and as most farmers have no access to irrigation, when the rains do not come, farmers face substantial impacts. Nearly 40 per cent of Ethiopia's over 90 million population is considered food insecure. Over the period 1980-2010 ten major drought disasters were reported in Ethiopia.⁸

2.1. Current Climate Trends

Precipitation

Seasonal rainfall in Ethiopia is driven mainly by the migration of the Inter-Tropical Convergence Zone (ITCZ). Most of Ethiopia experiences one main wet season (called 'Kiremt') from mid-June to mid-September (up to 350mm per month in the wettest regions). Parts of northern and central Ethiopia also have a secondary wet season of sporadic, and considerably lesser rainfall from February to May (called the 'Belg'). The southern regions of Ethiopia experience two distinct wet seasons

⁷ Source; McSweeney et al, (2010), Christensen *et al.* (2007) and Daron, JD (2014). Regional Climate Messages

⁸ Trocaire case study

which occur as the ITCZ passes through this more southern position. The March to May ‘Belg’ season is the main rainfall season yielding 100-200mm per month, followed by a lesser rainfall season in October to December called ‘Bega’ (around 100mm per month). The eastern most corner of Ethiopia receives very little rainfall at any time of year. Warm phases of ENSO (El Niño) have been associated with reduced rainfall in the main wet season, July, August & September (JAS), in north and central Ethiopia causing severe drought and famine, but also with enhanced rainfalls in the earlier February to April rainfall season which mainly affects southern Ethiopia.

According to McSweeney, et al, (2010) the strong inter-annual and inter-decadal variability in Ethiopia’s rainfall makes it difficult to detect long-term trends. There is not a statistically significant trend in observed mean rainfall in any season in Ethiopia between 1960 and 2006. Decreases in JAS rainfall observed in the 1980s have shown recovery in the 1990s and 2000s. There are insufficient daily rainfall records available to identify trends in daily rainfall variability.

The regional models for East Africa also state that over the past half century there has been substantial multi-decadal variability in rainfall. Parts of central Ethiopia were unusually wet in the 1970s and unusually dry in the 1980s and 1990s, while other parts of East Africa experienced the opposite pattern.

Temperature

Ethiopia’s mean annual temperature has increased by 1.3°C between 1960 and 2006, an average rate of 0.28°C per decade. The increase in temperature in Ethiopia has been most rapid in July, August and September (JAS) at a rate of 0.32°C per decade. Daily temperature observations show significantly increasing trends in the frequency of hot days⁹, and much large increasing trends in the frequency of hot nights. The average number of ‘hot’ days per year in Ethiopia has increased by 73 (an additional 20% of days) between 1960 and 2003. The frequency of cold¹⁰ days has decreased significantly in all seasons except December, January and February (DJF). The frequency of cold nights has decreased more rapidly and significantly in all seasons.

The regional models for East Africa state that temperatures across the region have increased by 1.5 to 2°C on average over the past 50 years. The greatest increases are found in central regions, particularly in South Sudan where increases in the March to August period have exceeded 3°C.

2.2. Future Climate projections

Precipitation

Ethiopia’s projections from different models in the ensemble are broadly consistent, indicating increases in annual rainfall in Ethiopia. These increases are largely a result of increasing rainfall in the ‘short’ rainfall season of October, November and December (OND) in southern Ethiopia. The OND rainfall is projected to change by 10 to +70% as an average over the whole of Ethiopia. The Proportional increases in OND rainfall in the driest, eastern most parts of Ethiopia are large. The Projections of change in the rainy seasons April, May, June and July August and September which affect the larger portions of Ethiopia are more mixed, but tend towards slight increases in the south west and decreases in the north east. The models in the ensemble are broadly consistent in indicating increases in the proportion of total rainfall that falls in ‘heavy’ events. The largest increases are seen in JAS and OND rainfall.

⁹ Hot’ day or ‘hot’ night is defined by the temperature exceeded on 10% of days or nights in current climate of that region and season

¹⁰ Cold’ days or ‘cold’ nights are defined as the temperature below which 10% of days or nights are recorded in current climate of that region or season

Future regional projections of rainfall change also show both potential increases and decreases. Projections of rainfall vary considerably. There is a tendency for models to project wetting across the region in the October to March period but at present there is insufficient evidence to support statements suggesting a likely shift to drier or wetter conditions in the future at most locations

Temperature

The mean annual temperature is projected to increase by 1.1 to 3.1°C by the 2060s, and 1.5 to 5.1°C by the 2090s. Under a single emissions scenario, the projected changes from different models span a range of up to 2.1°C. All projections indicate substantial increases in the frequency of days and nights that are considered 'hot' in current climate. Nights that are considered 'hot' for the annual climate of 1970-99 are projected to increase more quickly than hot days, occurring on 29-66% of nights by the 2060s and 34-87% of nights by the 2090s. Nights that are considered 'hot' for their season are projected to increase the most rapidly in JAS, occurring on 53-99% of nights in JAS by the 2090s. All projections indicate decreases in the frequency of days and nights that are considered 'cold' in current climate. Cold nights decrease in frequency more rapidly than cold days, not occurring at all in most model projections by the 2090s under the highest emissions scenario.

Projected Weather and Climate

- Median annual temperature will continue to increase through the 2090s.
- Although there are significant discrepancies between model predictions for rainfall for many areas in Africa, current rainfall projections for Ethiopia for the 2060s range from a decrease of 6 percent below the observed 1970-99 average to an increase of 24 percent.
- Most models predict a larger percentage of precipitation falling during heavy events, which can increase the risk of disasters such as floods and landslides.

USAID, 2012

Future regional projections of temperature change show significant increases across the region. The largest increases in temperature are projected for central and northern regions. Projected increases in average annual temperatures range from no change to 4°C by 2050, though model projections are subject to substantial uncertainties. Relatively high/low increases are more likely under a higher/lower greenhouse gas emissions scenario.

2.3. Green House Gas (GHG) Emissions for Ethiopia

According to the WRI CAIT climate data explorer for Ethiopia¹¹ for the years 1990-2013, latest emission values excluding Land Use Change and Forestry (LUCF) were 123.37 % with per capita GHG emissions of 1.30 tCO₂e presenting 99.26% absolute change from earliest (1990) emission values to the latest (2013) value. Total emissions values including LUCF were at 143.01% with per capita emissions of 1.51 tCO₂e and 48.80% as absolute change from earliest to latest value¹². The highest emission contributions are from agriculture, energy and LUCF respectively, and have been increasing overtime.

The INDC (2015) intends to reduce emissions of at least 64% below the Ethiopian business-as-usual (BAU) scenario by 2030, where emissions including LULUCF are projected to reach 400 MtCO₂e. The corresponding GHG emissions reduction target for 2030, excluding LULUCF, is 40% below BAU, or 185 MtCO₂e, which is the emissions level used to rate the emissions reduction

¹¹ <http://cait.wri.org/profile/Ethiopia>

¹² FAO 2014, FAOSTAT Emissions Database

target. Full implementation of the INDC is conditional on finance, technology transfer and capacity building support under the framework of Ethiopia's Climate Resilient Green Economy (CRGE) strategy, which is integrated in the Second Growth and Transformation Plan (2015-20).

If policies are successfully implemented, the INDC target could be achieved in 2030. Uncertainty remains on the effectiveness of current policies in place, which is reflected in a range of current policy projections. The majority of the population still relies on biomass to fulfil its energy needs however, a fuel-transition towards modern sources of energy seems promising. The biomass use puts high pressure on forests, where emissions from deforestation have increased significantly over recent decades. Indeed, the most efficient way of reducing emissions is to reduce fuel-wood consumption, by using efficient stoves and modern (e.g. electricity based) cooking technologies. Emissions from forestry are projected to reach 90 MtCO_{2e} in 2030. Emissions from the Forestry sector can be tackled via Reducing Emissions from Deforestation and Forest Degradation (REDD) initiatives, and Ethiopia has already put in place the second-largest afforestation and reforestation programme in the world.¹³

The majority of country emissions are from livestock (42%) and deforestation (37%) therefore reduction goals are focused on Agriculture, Forestry, and Other Land Use (AFOLU). According to Ethiopia's Second National Communication (2015), the largest contributors to future GHG emissions will be agriculture (emissions are expected to reach 70-160 MtCO_{2e} in 2030) and the industry sector (50-70 MtCO_{2e} in 2030). Mitigation goals were developed by forecasting Ethiopia's economic development and estimating the associated emissions using economic targets, past performance, and the ambition to reach middle-income status before 2025. Achieving the lower end of the range of the current policy projections, assumes an effective implementation of the CRGE strategy as referenced in the INDC. This lower-bound scenario is based on the GTP II, which reiterates that Ethiopia's Climate Resilient Green Economy strategy is fully implemented until 2020 (Federal Democratic Republic of Ethiopia, 2016).

2.4. Climate and Weather information generation and management

The National Meteorological Agency (NMA) of Ethiopia is responsible for establishing meteorological stations all over Ethiopia, collect data, analyse, interpret meteorological and climate information, forecast weather, and issue early warnings. It also provides applied meteorological services specialized for agriculture, water, health and air navigations. Meteorological services have been delivered for the last 60 years in different capacities. Currently, NMA set an ambitious vision of providing world class meteorological service by 2022. The National Meteorological Agency of Ethiopia has undertaken the Business Process Reengineering study and come up with 25 Directorates. Among these 11 of them are situated at all regional states of Ethiopia. The Agency has more than 800 professional staff in many disciplines. It has also about 400 observers employed on contractual basis. It has more than 1200 employees.¹⁴ Such service requires extensive and representative monitoring stations, modern and advanced computational capacity, and above all, highly experienced and qualified professionals. NMA in its 5-year plan tried to address some of these demands by expanding modern observational systems, such as automatic weather stations, career structure and accredited training center for meteorological technicians.

Regarding station distribution, the National Meteorological Agency has more than 1200 conventional stations, 25 automatic stations, an upper air observation, and AWOS at different airports of the country. It also receives satellite images every fifteen minutes from the MSG2 satellite which was launched by the EU. The Agency utilizes analogue technique for forecasting purposes. It is also experimenting with the Numerical Weather Prediction and Climate Prediction Tool (CPT).

¹³ Climate action Tracker 2016. <http://climateactiontracker.org/countries/ethiopia.html>

¹⁴ <http://www.ethiomet.gov.et/about/facilities>

The National Meteorological Agency disseminates its products via broadcast, print and online Medias.

For the past several decades, the National Meteorological Agency (NMA) of Ethiopia has provided a wide range of weather and climate services for various socio-economic applications. The agricultural sector has been identified as the main user of information that NMA continuously disseminates which includes summary of weather and climate assessment and predictions with agro meteorological applications for various space and time scales. Weather and weather-related information is very important for farming communities. NMA provides weather forecasts in different types and formats. The agency uses television, radio, faxes, postal services and websites to disseminate the forecasts and bulletins to users.

Regional coordination bodies include the African Ministerial Conference on Meteorology (AMCOMET), which was established as a high-level mechanism for the development of meteorology and its applications in Africa. Ministers in charge of meteorology unanimously committed to strengthen and sustain National Meteorological and Hydrological Services (NMHS) by providing them with the necessary resources and adequate institutional frameworks to enable them to fully perform their roles as a fundamental component of national development infrastructures.¹⁵

At institutional level, weather information used include seasonal, monthly and daily forecasts. Seasonal forecasts are the most commonly used weather information by the organizations. The main sources of weather information cited are the National Meteorological Agency (NMA) website, regional and zonal meteorological branch offices, Melkassa Agricultural Research Center (MARC), mass media and agricultural offices. Most institutions use information to support users make appropriate agricultural decisions during the rainy and dry seasons. It's also used for research and planning.

There are several development agencies supporting/partnering with NMAE to strengthen weather and climate services, including; UNDP with funding from the LDCF – GEF, Irish Aid through the World Meteorology Organisation, Christian Aid with support from DFID BRACED programme (a consortium of BBC Media action, Kings collage London, UK Met Office, Action Aid Ethiopia and the Ethiopian National Meteorological Agency), AMREF and OXFAM GB.

The World Food Programme (WFP) and Oxfam America (OA) launched the R4 Rural Resilience Initiative (R4) in 2011 to enable vulnerable rural households to increase their food and income security in the face of increasing climate risks. R4 builds on the initial success of the Horn of Africa Risk Transfer for Adaptation (HARITA) initiative, pioneered in Ethiopia since 2009 by OA, the Relief Society of Tigray (REST), Swiss Re, and other partners. R4 has broken new ground in the field of rural risk management by enabling the poorest farmers to pay for crop insurance with their own labour. Farmers access weather index insurance (WII) by paying with their labour through Insurance-for-Assets (IFA) schemes. When a drought hits, compensation for weather-related losses prevents farmers from selling productive assets and stimulates faster recovery. By protecting farmers' investments in case of a bad season, R4 enables households to invest in diversified income generating activities, as well as in seeds, fertilizers and new technologies to increase their agricultural productivity.¹⁶ However, for such programmes to work effectively, weather and climate services need to be strengthened to provide timely, understandable, reliable and accurate data for end users.

¹⁵ Integrated African Strategy on Meteorology (Weather and Climate Services), 2012

¹⁶ www.wfp.org/climate-change/initiatives/r4-rural-resilience-initiative

Key Challenges

Despite the above setup and infrastructure, the following challenges still exist in regards to effective and efficient generation, communication and use of weather and climate information at various levels.

The available weather stations throughout Ethiopia are unevenly distributed and the majority of stations are located along the main roads. This imposes severe limitations on the availability of

Improving data availability alone will not guarantee the use of climate information in development practices. Rather, extra efforts like capacity building and training are needed to ensure that the information is both accessible and useful.

Dinku and Sharoff, 2016.

climate information in rural communities where these services are needed most. Where observations are taken, they are often low quality and unavailable beyond the respective national meteorological services. Lack of climate information has also been one of the major constraints for integrating climate into development planning and practice in Africa. Furthermore, the Ethiopian NMA is usually very protective of its databases and maintains restrictive data dissemination policies, which limits the distribution of climate information within Ethiopia (Dinku and Sharoff, 2016).

Reaching last mile end users has been identified as the main challenge. Disseminating through intermediaries including, agricultural extension services and media, has not yet been effective. Institutional linkages also need to be strengthened with stakeholders working on food security and climate adaptation issues.

In terms of access to weather information, studies conducted show that access to weather information such as seasonal cropping practice and seasonal climate forecasts is happening. The sources of weather information cited include local media, district agricultural offices and NMA. However, community members reported that the information they get is not clear and easy to understand. Others reported that the probabilistic forecast says normal to above normal rainfall could be anticipated for pocket areas of a region which was difficult for them to interpret, as it is difficult to identify the exact areas that would receive the forecasted rainfall. Therefore, it is difficult to use the weather forecasts they receive for agricultural decision making. Farmers also indicated the difficulty in understanding the forecast details and terminologies used. Other problems mentioned by farmers in accessing weather information are the irregularity on the time of broadcasts/telecasts and language used. In addition, lack of awareness of weather information services, lack of knowledge about the role of weather information, and absence of centres that coordinate and downscale weather information at local level were mentioned as common problems (Feleke, G.F., 2015).

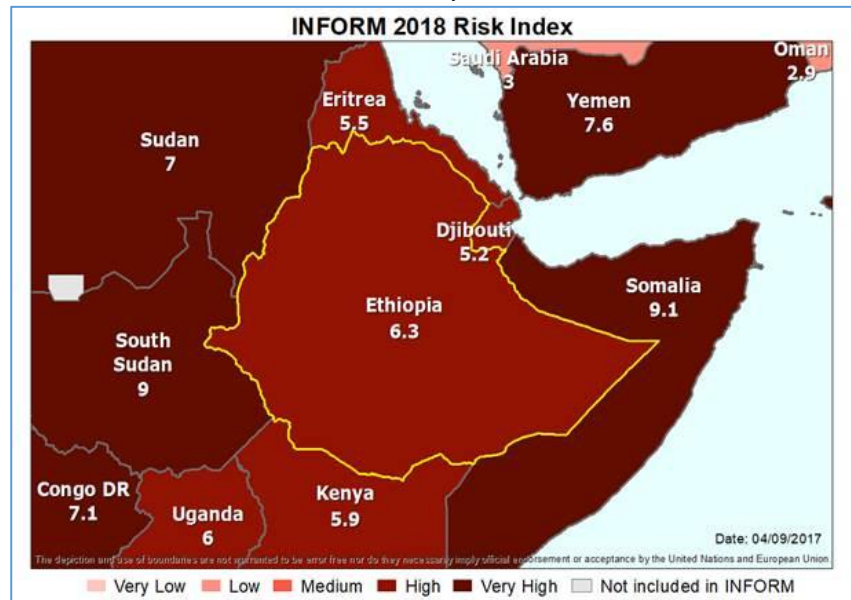
3.0. Climate change hazards, Impacts and Vulnerability

Ethiopia is prone to droughts, floods, landslides, pests, earthquakes, and urban and forest fires. The country's vulnerability to natural hazards is due to a number of factors including dependence on rain-fed agriculture, land degradation, and weak institutional coordination. Ethiopia has a long history of recurring droughts, which since the 1970s have increased in magnitude, frequency, and intensity. Furthermore, pasture and water shortages have caused massive livestock deaths in the south and south eastern parts of the country. Climate change studies show that vulnerability to cyclic hazards is increasing, especially among the poor. Moreover, due to climate change as well as additional human-induced factors, the areas affected by drought and desertification are expanding

in the country. Ethiopia, due to its geo-physical position and socio-economic context, is prone to several types of recurrent natural and human-induced disasters. Drought seriously impacts pastoral regions, which cover 50 to 61 per cent of the surface area of Ethiopia. In these semi-arid and arid regions droughts and temperature rise cause traditional water sources for people and livestock to rapidly disappear.

According to the Index for Risk Management (INFORM)¹⁷ country risk profiles for 2018, Ethiopia is ranked as high risk. Out of 191 countries, Ethiopia ranks as the 16th most at risk country, the 39th in terms of hazard and exposure, the 11th in terms of vulnerability and the 27th in terms of lack of coping capacity.

The INFORM¹⁸ model adopts the three aspects of vulnerability reflected in the United Nations Office for Disaster Risk Reduction (UNISDR) definition. The aspects of physical exposure and physical vulnerability are integrated in the hazard & exposure dimension, the aspect of fragility of the socio-economic system becomes INFORM's vulnerability dimension while lack of resilience to cope and recover is treated



under the lack of coping capacity dimension. According to the Index for Risk Management, Ethiopia is ranked as high risk, with exposure to hazards including floods, droughts and earthquakes with high risk of increased conflict risk and human exposure to hazards. Vulnerability is high in relation to impacts on development, displaced people, vulnerable people and increased inequality. The country also has low coping capacity in the areas of infrastructure, communication, access to health and governance. Ethiopia will require strong climate governance and institutional capacity strengthening to foster adaptation and resilience to climate impacts.

The Government of Ethiopia is focused on combating recurrent droughts and food insecurity through a proactive approach to Disaster Risk Management (DRM). In the recent past years, the Government has created the Disaster Management and Food Security Agency, drafted a National Policy and Strategy on Disaster Management, and designed a DRM Strategic Program and Investment Framework for government and donor interventions. The principal challenges remain, including insufficient capacity to carry out analysis and advocacy for enhanced understanding of risks and impacts, development and strengthening of building codes, land-use and urban planning, contingency planning, among others

3.1 Social Economic Vulnerability due to climate change

Risk and vulnerability to disasters including man made ones can have devastating impact on the abilities of households and communities to respond to and cope with risks and shocks posed by climate hazards. Effective risk management is critical in the fight against poverty as it unlocks opportunities, mitigates crises, and protects the poor in times of disaster and shock. Building people's resilience and reducing the effects of adverse events and allowing them to take advantage

¹⁷ <http://www.inform-index.org/Countries/Country-profiles/iso3/BIH> accessed on 31/10/017

¹⁸ InfoRM is a collaborative project of the [Inter-Agency Standing Committee \(IASC\)](#) and the [European Commission](#)

of development opportunities is important. A resilience approach will be required to empower countries, communities, institutions, women, and men to anticipate, absorb, adapt to or transform shocks and stresses.¹⁹

Ethiopia's Socio-Economic Statistics

Population 2017²⁰: 99,873,000

Total Fertility Rate 2015²¹; 4.043 children/woman

GDP per capita, PPP²² (international \$) 2016: 1,734.918

HDI 2015: 174 out of 188 countries²³

Gender Inequality Index 2015; 116 of 159 countries²⁴

Vulnerability Rank 2015; 146 out of 178 countries²⁵

Climate Risk Index (CRI)²⁶ 2015²⁷; 66 out of 187 countries

Climate change and Extreme Events

Ethiopia ranks 146th out of 178 countries in the ND-GAIN Index (2015). The ND-GAIN Country Index summarizes a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience. It aims to help governments, businesses and communities better prioritize investments for a more efficient response to the immediate global challenges ahead. The trend for Ethiopia has not improved since 1995 where it was ranked 151 out of 178. The high vulnerability and low readiness scores calls for a greater need for investment and innovations to improve readiness and a greater urgency for action. Ethiopia is the 36th most vulnerable country and the 40th least ready country.

Vulnerability measures the exposure, sensitivity, and ability to cope with climate related hazards as well as accounting for the overall status of food, water, environment, health and infrastructure within a country. From the statistics for 1996 - 2015, there is a negative trend in terms of vulnerability, meaning vulnerability is increasing in relation to food, water, ecosystems, human habitat and infrastructure, except for health which has remained constant. Readiness targets those portions of the economy, governance and society that affect the speed and efficiency of adaptation. Regarding future climate change, the Climate Risk Index may serve as a red flag for already existing vulnerability that may further increase in regions where extreme events will become more frequent or more severe due to climate change.²⁸

¹⁹ Irish Aid, 2016. Briefing note; Building resilience

²⁰ UN World Population Prospects, 2017. <https://esa.un.org/unpd/wpp/Download/Standard/Population/>

²¹ <http://data.worldbank.org/indicator/SP.DYN.TFRT.IN>

²² World Bank Data – GDP per capita, PPP <http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>

²³ UNDP 2016; Human development Index report for 2015

²⁴ <http://hdr.undp.org/en/composite/GII>

²⁵ ND GAIN country index - <http://index.gain.org/country/Ethiopia> accessed 11/07/2017

²⁶ The CRI indicates a level of exposure & vulnerability to extreme events, which countries should understand as warnings in order to be prepared for more frequent and/or more severe events in the future

²⁷ <https://germanwatch.org/en/12978>

²⁸ German Watch, 2016

According to the ND GAIN readiness statistics, Ethiopia has recorded improvement in economic areas especially doing business. Governance, political stability and nonviolence are scored poorly but there are promising scores on control of corruption, regulatory quality and rule of law. Social readiness is low especially ICT infrastructure, education and innovation. According to Global Climate Risk Index,²⁹ 2015, Ethiopia is one of the ten African countries most affected in the period 1996-2015.

Climate change and resultant disasters have continued to reverse the development trends. Drought has tested the resilience of Ethiopia not only in providing for its own population, but also planning for refugees. The number of refugees has increased from 300,000 in 2011 to over 700,000 in 2015, and over 840,000 in 2017. Refugees in the country are mainly from South Sudan, Somalia, Eritrea and Sudan. Internal displacement is also continuing in Ethiopia, due to the ongoing drought, crisis levels of food insecurity and inter-communal clashes. In 2015-2016 Ethiopia experienced its worst drought in 50 years. Northern, eastern and central parts of the country bore the brunt of the El Nino weather event, with back-to-back seasons of poor rainfall and severe drought. A new drought has now emerged in 2017 in southern and south eastern pastoral areas of the country, including the Somali, Oromia and SNNP regions, causing crisis levels of food insecurity and alarming rates of acute malnutrition.³⁰

Key climate change Impacts in Ethiopia

- ✓ Frequent and severe droughts
- ✓ Floods
- ✓ Increase in temperature
- ✓ Erratic and uneven rainfall
- ✓ Shifts in the onset and cessation of the seasonal rainfalls, and shorter rainy days
- ✓ General water stress and scarcity
- ✓ Increased heat waves and windy days
- ✓ Increased health risks (malaria, diarrhoea, and malnutrition)
- ✓ Hailstorm and frost in some areas
- ✓ Increased landslides and soil erosion

NEPAD, 2012

3.2. Climate change impacts on Agriculture and Food Security

In Ethiopia, there is a strong link between climate change, food security and rural livelihoods. For many decades, agricultural production in the country has not kept pace with population increase. Especially in the drought prone and food insecure areas, food insecurity with high malnutrition has long remained a major problem where millions can quickly become dependent on relief aid during major droughts and in times of widespread livestock deaths, crop infestations and unseasoned floods. On the other hand, during prolonged drought years, increasing distances between water and pasture cause problems to the health of cattle and create local conflicts over resources in pastoral areas (NEPAD, 2012). Food shortages have increased in severity, with frequent shortages in recent years. The degree of vulnerability varies between the different regions based on wealth, technology, availability of infrastructure and institutions, potential for irrigation, and literacy rates. In general, vulnerability to climate change in Ethiopia is highly related to poverty. Integrated rural development initiatives aimed at reducing poverty can play a role in increasing adaptive capacity to climate change.

The major effects of climate change on crop production include changes in regular crop planting times, length of growing season and shift in crop type or cultivars. Crop production in the country is highly correlated to the rainfall patterns. Rainfall variability and recurrent drought are leading to frequent crop failures, loss of life and property. Indigenous and improved technologies are used to reduce crop yield losses. Climate change exhibited through higher temperatures, rainfall variability,

²⁹ The Global Climate Risk Index analyses to what extent countries have been affected by the impacts of weather-related loss events

³⁰ Irish Aid status report, July 2017

water scarcity, flooding, drought and displacement, negatively impacts agricultural production and causes breakdown in food systems. Vulnerable groups risk further deterioration into food and nutrition crises if exposed to extreme weather events. Without considerable efforts made to improve climate resilience, it has been estimated that the risk of hunger and malnutrition globally could increase by up to 20 percent by 2050. In Ethiopia, the prevalence of child malnutrition in children under age 5 is 25.2% (Oxfam 2010; CGIAR 2013)

The impact of climate change and climate variability on livestock resources and feed is also a big concern in Ethiopia. There is considerable variability and uncertainty in climate change projections and on the outcome of climate change and climate variability.

For small holder farmers opting to step-up in an agriculture-based and productive cross-sector, social safety nets that combine long-term tools with short-term support are necessary. Focus on investing in infrastructure, agricultural research and extension, and smallholder-friendly and climate-resilient technologies; and, access to innovative financial services are required.

For stepping-out to happen in agriculture based economies, social safety nets, nutrition-focused crop production for own consumption, education and training for nonfarm employment, and migration to urban centres and other agriculture areas with greater profit potential are required.

(Irish Aid and IIED 2017).

Climate change will have far reaching consequences on livestock production mainly arising from its impact on grassland and rangeland productivity. The indirect impact of climate change will be on water, feed, and fodder which are the most important inputs for livestock production. Compared to crops, much less is known about the effects of climate change on livestock, particularly in Ethiopia (Getachew, 2013). Livestock activities contribute 18% of total global anthropogenic GHG emissions (including deforestation for grazing land), which is more than the contribution from

transport. Livestock is the single largest anthropogenic user of land globally and accounts for 9% of anthropogenic carbon dioxide emissions, most of which is due to the expansion of pastures and arable land for feed crops (FAO 2006).

Integration of climate change into agriculture planning systems will be very important to reduce the impacts and vulnerability of the farmers, but also curb mitigation through better livestock practices and climate smart agriculture.

3.3. Climate Change impacts on health and Nutrition

Climate change is leading to rising rates of mortality and diseases caused by extreme weather events. These include floods, droughts, heat-waves and other disasters which kill thousands of people in both the developed and developing worlds. Disasters usually make the headlines, but the indirect health consequences of climate change are just as important. Higher temperatures pose major health risks to older people and raise the likelihood that those who work outside such as farmers and builders will suffer from heat exhaustion and heat stroke. Many killer diseases, including malaria and cholera, increase as temperature and rainfall increase. The mosquitos that carry the malaria virus, for example, thrives in hot and humid conditions with projected increase in temperature in Ethiopia, Malaria is likely to be more common. By 2070, almost 130 million people are projected to be at risk of malaria assuming a high emissions scenario.

According to the World Health Organization (WHO) climate and health country profile for Ethiopia, 2015, climate change is threatening to exacerbate health problems. Increased temperatures, intense heat waves, more extreme rainfall, floods and landslides, are expected to intensify existing

challenges of communicable diseases, food insecurity and poverty unless timely action is taken. An outbreak of acute watery diarrhoea/cholera in parts of the country is rapidly spreading. It is estimated that 9.2 million people require access to safe drinking water and sanitation services. The current situation for children is especially grave, with some 400,000 children expected to suffer from

In Ethiopia, under a high emissions scenario, diarrheal deaths attributable to climate change in children under 15 years old is projected to be about 9.6% of the estimated 42,000 diarrheal deaths projected by 2050. Although diarrheal deaths are projected to decline to about 15,500 towards 2070, the proportion of deaths attributable to climate change is projected to rise to approximately 14.1%.

(WHO 2015)

In Ethiopia, 63% percent of an estimated 36,800 child deaths are due to acute lower respiratory infections attributable to household air pollution

(WHO, 2012).

severe acute malnutrition and at least 2.7 million more from moderate acute malnutrition. Increases in the number of children with severe acute malnutrition being admitted to stabilization centres, where their risk of mortality substantially increases, are already being reported (56% increase in Somali region's severe acute malnutrition therapeutic feeding program in March 2017 alone).

According to Ethiopia's GTP II, primary health care service coverage has increased to 98 percent by 2014/15 however, maternal and child mortality rates

remain high. GTP II has planned to tackle the issues of health through the implementation of the national nutrition strategy, reducing maternal and child mortality rates and expand primary health care service coverage from 98 percent in 2014/15 to 100 percent by 2019/20, ensuring universal coverage in primary health, Social and health security will be ensured for the elderly by working together with stakeholders that provide social security services. In addition Ethiopia has conducted a health-climate change vulnerability assessment, developed a strategic framework for climate change and health, and has drafted a national adaptation plan to mitigate the impact of climate change on health. Additionally, Ethiopia has implemented actions to build institutional and technical capacity on climate change and health. Country-reported data indicate that there are further opportunities for action in adaptation; for instance implementing activities to increase climate resilience of infrastructure, including health infrastructure, and estimating costs to strengthen health resilience to climate change (WHO, 2015).

3.4. Climate change impacts on the environment

In recent years environment has become a key issue in Ethiopia. The main environmental problems in the country include land degradation, soil erosion, and deforestation, loss of biodiversity, desertification, droughts, floods and water and air pollution. Climate change is likely to exacerbate the impacts of degradation of the country's environmental resources including arable land, water, pasture and forests with connected impacts on Ethiopia's food and water securities.³¹

The economic and social dependence of the population on climate-sensitive sectors is further exacerbated by widespread environmental degradation in parts of the country. Even without the threat of climate change, Ethiopia's environmental risks are well documented and have a direct impact on the livelihoods and vulnerability of the poor.

³¹ UNDP, 2017. <http://www.adaptation-undp.org/explore/eastern-africa/ethiopia>

In the late 19th century, about 35-40 per cent of the country was forested. Over exploitation has massively depleted the country's woodlands to the extent that cover had dwindled to less than 4 per cent of the total land surface by the turn of the millennium. Intensive Government efforts in reforestation have increased the cover, but it still remains under 10 per cent. The current rate of deforestation is estimated to be in the region of 150,000 - 200,000 hectares per year, and the FAO has estimated that fertile topsoil is lost at a rate of over one billion cubic meters annually (FAO, 2013).

Climate change is expected to affect biodiversity significantly, because it will change the environment and climatic conditions where plants and animals live. It is estimated that if the global average temperature increases by 1.5 °C to 2.5 °C, many species will not be able to survive in the warmer environment and about 20–30% of the world's plant and animal species will become extinct by the 2080s, and between 25% and 40% of mammal species in sub-Saharan Africa will become endangered.

(IPCC, 2007).

3.5. Climate change impacts on water resources

Climate change will reduce raw water quality and even pose risks to treated drinking water because of anticipated increases in extremes. Increased intense rainfall will bring increased floods and soil erosion, which introduces sediments and pollutants in fresh water bodies. Soil erosion is already a serious problem in Ethiopia. Every year, 1.5 billion metric tons of topsoil erodes from the highlands into streams and rivers, thus increasing sediments, pollutants and reducing stream flows. Climate change is only one of the many pressures that will determine access to water in future decades. Forty-eight per cent of the population in Ethiopia is without access to safe water and relies on water sources such as unprotected springs, ponds, streams and rivers many of which are located far from households and are contaminated (Mahoo, et al, 2013)

Water development for the agricultural sector, especially irrigation, has not been adequately addressed despite the huge potential within the country. According to the recent data from Ministry of Water Resources, the total potential irrigable land of the country is estimated to be 3.7 million hectares. Of this, 2.9 million hectares have potential for irrigation, with medium and large scale irrigation schemes. Currently, less than 5% of the total land that can benefit from irrigation is under irrigated agriculture. The irrigated area varies from small to large size schemes with a variation across regions

Human induced changes in land use and low levels of water management have accelerated desertification processes. Consecutive droughts have led to chronic water scarcity across many parts of the country, leading to acute water shortages. This means that areas dependent on rainfall are getting exposed to water shortages in years where the seasonal rainfalls perform poorly and fail to recharge rivers, groundwater and soil moisture. In addition, water resources in Ethiopia are becoming limited and land holding is becoming fragmented due to increasing population.

In 2011, Ethiopia began building the Grand Ethiopian Renaissance Dam Project (GERDP) on the Blue Nile River which hold 74 billion cubic meters (BCM) storage capacity and about 60 BCM live storage which will produce 6000 MW electric generation. The primary objective of GERDP is to generate electric power of 6000MW, with an annual energy production of 15130GWH/year to cover the power supply demand in the country as well as in the East Africa region. The benefits of GERDP is not limited with power supply, it can also benefit the downstream countries mainly Sudan and Egypt by removing silt and sedimentation, by regulating the water flow and by conserving water in Ethiopian highlands (Tesfa, 2013). However, the Blue Nile River being a source of around 85% of the Nile River water, there are concerns that the project will alter the flow of the Blue Nile River which will affect the neighbouring countries (Sudan and Egypt), which are located downstream and which rely heavily on the water from the River. The real scale of the environmental impacts of GERD, under construction upstream of the Nile River, together with the rising sea levels, due to climate change, leading to saltwater intrusion downstream, are still not yet clear. (Yihdego, Khalil and Salem, 2017).

Climate changes, population growth, increasing water demand, overexploitation of natural resources and environmental degradation have significantly degraded the world's freshwater resources. It is predicted that rain-fed crop yields in some countries will decrease by 50% and that an estimated 50 – 250 million Africans will face increased water stress by 2020.

IPCC, 2017

Water scarcity will increase tensions, disputes and conflicts including cross border conflicts. Climate change is also expected to lead to increased water stress, increasing frequency and intensity of floods and deteriorating water quality (NMA, 2006). This is likely to have a particularly harsh effect on women and girls because of their distinct roles in relation to water use and their specific vulnerabilities in the context of disasters. Integrated water resource management should be prioritised, in addition to restoration of degraded ecosystem.

3.6. Climate Change, Poverty and Inequality

From a poverty perspective, climate change impacts are projected to slow down economic growth and make poverty reduction more difficult. Sustainable development and equity should provide a basis for assessing climate policies. Limiting the effects of climate change is necessary to achieve sustainable development and equity, including poverty eradication. Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development (IPCC, 2014)

The 2011 Multidimensional Poverty Index (MPI)³² survey data for Ethiopia, identified multiple household deprivations in education, health, and general living standards. In Ethiopia, 80 percent of the population are multi-dimensionally poor while an additional 6.7 percent live near multidimensional poverty. The breadth of deprivation (intensity) which is the average deprivation score experienced by people in multidimensional poverty, is 60.9 percent. The multidimensional poverty headcount is 54.7 percentage points higher than income poverty. This implies that individuals living above the income poverty line may still suffer deprivations in education, health and other living conditions.

³² Identifies multiple overlapping deprivations suffered by households in 3 dimensions: education, health and living standards

People who are already poor and marginalized are struggling with the added burden of climate variability, and it is likely that this variability will only increase. Key challenges include loss of income,

People who are already poor, especially small holder farmers, pastoralists, women, female headed households, the disabled and those living with HIV/AIDS, will disproportionately be impacted by climate change given its multifaceted and growing impacts.

food insecurity, increased workloads, limited livelihood options which, combined, make it difficult to recover from climate impacts. It should also be noted that vulnerability is not the same for different populations living under different environmental conditions and confronting different social, economic, political, and institutional challenges. Poverty, limited resources (such as land and livestock), lack of alternative sources of income and livelihoods, lack of knowledge and expertise, increase

vulnerability and decrease people's capacity to cope (Oxfam, 2010). What is required are holistic approaches to build people's resilience to climate change impacts. A resilience approach is a way of working that helps to build resilience in order to protect the assets – property, knowledge, well-being, security and social cohesion of poor people and countries in the face of a range of shocks and stresses. Adopting a resilience approach helps to shine a spotlight on the root causes of poverty, inequality and exclusion from the perspective of communities (Irish Aid, 2016)

3.7. Gender inequality and Climate change

According to the 2015 human development report for Ethiopia, the country has a Gender Inequality Index (GII) value of 0.499, ranking it 116 out of 159 countries in the 2015 index. In Ethiopia, 37.3 percent of parliamentary seats are held by women. In terms of health, for every 100,000 live births, 353 women die from pregnancy related causes; and the adolescent birth rate is 58.4 births per 1,000 women of ages 15-19. Female participation in the labour market is 77.0 percent compared to 89.1 for men. Women head 26% of households and as of 2013, 52% percent had no formal education, as compared to 38% of men. The majority of the poorest groups are composed of women, the disabled, and those living with HIV/AIDS. Women constitute nearly half of the country's population, and many of them are living in dire economic conditions with endemic poverty and poor working and living conditions. Rural women in Ethiopia are responsible for securing food, water and energy needs of their households (World Bank, 2015).

Existing gender inequality will be heightened by climate-related hazards. Men and women are differently affected by climate change and climate variability related disasters intertwine with socio economic, institutional, cultural and political drivers. Women play a vital role in food security. In Ethiopia, as in most African countries, more women than men are engaged in the production, distribution and utilization of food. Agriculture is therefore central to women's livelihoods, with climate change impacts on agricultural production making women especially vulnerable. Evidence shows that during extreme weather conditions, women experience more social disruption given a greater reliance on agricultural employment in rural areas as compared to men employed in service sectors across the country.

The effects of extreme climate events; droughts, floods and rising temperatures, among others are putting greater pressure on poor women farmers and livestock herders to shoulder the adverse consequences on the household. Unless the gender aspect is addressed directly in climate change and agricultural development policy making and programming, climate change and the resultant food insecurity will increase the existing gender gap. (WHO, 2015; NEPAD, 2012, Oxfam, 2010)

According to NEPAD, 2012, gender roles tend to change during hardships, such as droughts. When drought comes, men will migrate looking for work in construction, factories, and hotels. This male migration puts more responsibilities on women's shoulders. Quarrels, violence against women, and divorce were cited as common during times of drought. Also during times of drought, women look for off-farm activities. Poor rural women also have unequal access to information and resources, and are under-represented in decision-making which makes them even more vulnerable to extreme weather events.

The NEPAD study also noted that there was increased incidence of climate sensitive diseases and women are most affected. Informants stressed that because of repeated and prolonged droughts and reduced crop and livestock production, many food insecure households suffer from illness associated with malnutrition and under feeding. And from the narratives documented during the field work, in all the sites visited, women and girls disproportionately suffered from lack of adequate and nutritious food as well as bearing the burden of caring for the sick.

For adaptation efforts to be effective and sustainable, gender considerations should be taken into account. Women, girls, men and boys experience the impacts of climate change differently and have different needs, opportunities and capacities to respond. If gender is not

integrated in adaptation and mitigation actions, gender inequalities will be exacerbated, increasing vulnerabilities especially for women and girls. Gender analysis should be promoted to understand the differentiated underlying causes of vulnerability to climate change for men and women, boys and girls, and designing adaptation options that are gender transformative.

- Age, sex and differences in gender roles and norms are significant factors in mortality due to natural disasters
- About half of the population in developing regions lack access to improved drinking water; and the burden of water collection falls mostly on women and girls.
- Women remain underrepresented in local and high level environmental decision making foras
- Adequate monitoring of the impact of the environment and climate change on the lives of women and men may require that some data disaggregated by sex and age are recorded for smaller areas of a country

UN, 2015, Trends and Statistics

3.8. Economic Impacts of climate change

It is estimated that adapting to climate change in the areas of agriculture, energy provision and road infrastructure may cost an annual average of \$0.8-2.8 billion USD. Climate change impacts are likely to be felt most by the rural poor and particularly women. The poor in urban areas are also likely to be negatively impacted due to increasing food prices. In addition, extreme climatic events have historically been shown to be costly to individuals, reducing consumption or forcing the sale or destruction of assets; thereby re-enforcing poverty.³³

³³ Alebacheu, A. and Woldeamlak, B, 2011

Climate change poses a statistically significant impact on agricultural production. The major impact of climate change on Ethiopia's economy will result from more frequent occurrences of extreme hydrological events, which cause losses in the agricultural and non-agricultural sectors. If further irrigation development is not undertaken, the country will lose between US\$28 billion and US\$32 billion by the year 2050. This is about 40% of the GDP. The loss can be reduced to 35% if the water

By 2050, climate change could reduce Ethiopian GDP by 8-10 per cent and increase variability in agricultural production by a factor of two.

Agricultural production and output will be affected by climate change, which is likely to reduce Ethiopia's GDP by about 10 per cent from its benchmark level.

Climate change impacts will raise the degree of income inequality which is likely to further decrease economic growth and fuel poverty, especially among vulnerable communities

World Bank, 2015

sector development plan is implemented (FAO 2013). Ethiopia's national development plans place emphasis on promoting export-led industrialisation with a focus on light manufacturing. However, the contribution of the industrial sector to GDP, employment and exports remains low averaging 12.2% between 2006/07 and 2015/16. Dependence on climate sensitive sectors will therefore continue in the foreseeable future (Africa Economic Outlook, 2017)

Agricultural outputs are expected to fall while agricultural commodity prices increase. This affects the imports and exports composition. Due to the weak inter-sectoral linkage between agriculture and non-agriculture sectors in Ethiopia. However, the effects are mainly contained within agricultural sector and the rural households. Agriculture in Ethiopia is the main contributor to national income, employment, and food supply.

Variability in agricultural income tends to affect the poor more, with standard deviation values on average, some 10 percent higher than for the non-poor under both wet and dry scenarios. Climate change impacts also are likely to vary significantly across regions. The arid lowland zone derives substantial benefits from the increase in total rainfall, which supports livestock, while relative losses are concentrated in the cereals based highlands zone and in urban areas. The latter reflects the downstream consequences of flooding and weather variability. The dry scenarios have reverse impacts, with the arid lowlands and livestock suffering greatly.

Under climate change, renewed efforts will be necessary to buffer the economy from more frequent and/or severe climate shocks. These include strengthening social safety nets, access to relief funds, drought early warning systems, crop insurance programs, grain banks, and strengthening infrastructure design. In the longer term, however, accelerated diversification of income and employment sources away from climate-sensitive sectors such as agriculture is likely to become increasingly important under a more erratic climate.

4.0. Climate change policy Framework

In 2011 the government of Ethiopia finalised its "Climate-Resilient Green Economy" (CRGE), strategy, the first of its kind in Africa. The CRGE strategy builds on the Growth and Transformation Plan (GTP), the government's ambitious development plan, which sets the aspiration for Ethiopia to reach middle income levels by 2025. As the highest national policy framework, it governs developmental policies, budgets and government organisations. The CRGE strategy has been integrated into the second Growth and transformation Plan for 2015-2020. The strategy describes a new model of development that integrates measures of economic performance, such as GDP growth, infrastructure development, poverty reduction, job creation, and social inclusion, with those of environmental performance, such as improving resilience to climate shocks, mitigation of GHG emissions, biodiversity loss and ensuring access to clean water and energy. Strong economic

development and economic inclusion objectives are addressed simultaneously with environmental and social objectives: the green economy that will lead Ethiopia to middle-income status before 2025 requires the promotion of climate resilience.

In addition to the CRGE and the GTP II, there are other climate relevant policies and strategies which include the National Adaptation Plan of Action (NAPA), Nationally Appropriate Mitigation Actions (NAMAs), Climate Resilience Strategy: Agriculture and Forestry (2015), Intended Nationally Determined Contribution (INDC, 2015, Environmental Policy (1997), National Energy Policy (1994), Ethiopian Programme of Adaptation to Climate Change (2010), REDD+ strategy, the National policy and strategy on disaster risk management, 2013, among others.

4.1. Key Climate change policies and priority sectors

Policy/Strategy Name	Policy Priorities
Growth and Transformation Plan II (2015/16-2019/20)	<p>The GTP II acknowledges that in the long term, if climate change is not tackled, growth itself will be at risk. During the GTP II period, reducing greenhouse gas emissions will be through enhanced crop and livestock production that improve food security and income of farmers and pastoralists; natural resource development, forest protection and reforestation programs, expanding electricity power generation from renewable sources of energy for domestic and regional markets; leapfrogging to modern and energy efficient technologies in transport, industry and constructions are the basic strategies of building climate resilient green economy.</p> <p>The green economy agendas will be rigorously mainstreamed in macro and sector plans, programs and projects, and will be regularly monitored and evaluated to ensure accountability at all levels. Research institutions that work on green economy will be promoted whereby knowledge and technology transfer is facilitated</p>
INDC, 2015	<p>The INDC focuses on a target of a 64% decrease in the 2030 carbon emission covering key agriculture, forestry, transport, electric power, industry and construction sectors. The INDC is building on the Climate Resilient Green Economy (CRGE) Strategy and the second Growth and Transformation Plan (GTP II), Ethiopia's flagship national 5-year development plan. The proposed adaptation measures are based on the National Adaptation Programme of Action (NAPA) and the Ethiopia Programme of Adaptation to Climate Change.</p> <p>Mitigation sectors include; Agriculture (livestock and soil), Forestry, Energy, Transport, Industry, Buildings (including Wastes and Green Cities).</p>
Climate Resilience Strategy: Agriculture and Forestry (2015)	<p>This strategy follows from the CRGE strategy sharpening the focus on agriculture and forests by assessing the impact of current climate variability on those sectors and potential future impacts, identifying adaptation options, and mapping necessary steps to finance and implement these options. The Strategy concludes that climate change could cost Ethiopia 10% of its GDP or more by 2050 and that investments in climate resiliency for agriculture and forestry alone could cost \$600 million annually by 2030 and total resilience investment costs of \$3.5 billion annually by 2030.³⁴</p>
Climate Resilience Strategy: Water and Energy (2015)	<p>This Strategy identifies strategic priorities to respond to climate vulnerabilities and sustainable development needs under power generation, energy access, and irrigation, access to WASH, and cross cutting issues. The Strategy identifies financing needs of at least \$895 million until 2030. The Strategy intends to fund its priorities for two years through the CRGE Facility, its own revenues, the treasury and external assistance.</p>
National policy and strategy on disaster risk management, 2013	<p>The main objective of the Policy is to reduce disaster risks and potential damage caused by a disaster through establishing a comprehensive and coordinated disaster risk management system in the context of sustainable development.</p> <p>Key focus areas include; Reducing and eventually preventing disaster risk and vulnerability through integrating disaster risk reduction into development plans and programmes</p>

³⁴ CRGE, 2011

	<p>Saving lives, protecting livelihoods, and ensuring all disaster affected population are provided with recovery and rehabilitation assistances</p> <p>Reducing dependency on and expectations for relief aid by bringing attitudinal change and building resilience of vulnerable people</p> <p>Ensuring that disaster risk management is mainstreamed into development plans and programs across all sectoral institutions and implemented at all levels.</p>
CRGE (Climate Resilient Green Economy) strategy, 2011	Ethiopia's 2011 Climate Resilient Green Economy (CRGE) strategy sets out a vision, strategy, institutional arrangements, and financing arrangements to achieve sustainable economic growth and climate resiliency. The overriding vision articulated in Ethiopia's 2011 Climate Resilient Green Economy (CBRE) Strategy is to become a middle income country by 2025 through a climate-resilient green economy approach that emphasizes 1) improving food security while reducing emissions through crop and livestock practices, 2) protecting and restoring forests for ecosystem services and carbon stocks, 3) expanding electricity generation from renewable sources for domestic and regional use, and 4) leapfrogging to energy efficient technology in buildings, transportation, and industrial sectors.
Ethiopian Programme of Adaptation to Climate Change (2010)	Building off the NAPA, the EPACC calls for mainstreaming of adaptation into development planning, implementation, and monitoring. It identifies 20 climate change risks, including human health risks, threats to agricultural productivity and livestock, land degradation, water shortages, biodiversity, waste, displacement, and distributive justice. The EPACC shifted from a project-based NAPA to a more strategic approach to adaptation.
Climate Change National Adaptation Programme of Action (2007)	Ethiopia's NAPA drew upon stakeholder consultations and expert assessments to assess vulnerable sectors and groups and to identify 20 adaptation projects on the themes of human and institutional capacity building, improving natural resource management, enhancing water management and expanding irrigation for agriculture, strengthening early warning systems, and awareness raising.
Environmental Policy (1997)	To improve health and quality of life of Ethiopians through sustainable development, by developing sectoral and cross-sectoral policies to meet this goal, with Climate change considered as a cross-cutting and important environmental, social and development challenge that needs to be tackled It also includes sectoral policies on waste, water resources, forest resources, control of hazardous materials and industrial waste, biodiversity, sustainable agriculture, mineral resources, and cultural heritage.
National Energy Policy (1994)	Aimed to increase availability and affordability of non-biomass energy supplies to meet development goals such as oil and natural gas exploration, hydropower, coal, and energy conservation. The policy also sought to promote community participation especially that of women, in energy sector decision-making.

4.1.1. NDC Implementation progress

Ethiopia was one of the first countries to submit its INDC in June 2015. The INDC includes a 64% decrease in the 2030 carbon emissions target covering key agriculture, forestry, transport, electric power, industry and construction sectors. The outlined financial needs of USD 150 billion to implement the proposed activities might be revised following dedicated ongoing studies.

The INDC is building on the Climate Resilient Green Economy (CRGE) Strategy and the second Growth and Transformation Plan (GTP II), Ethiopia's flagship national 5-year development plan. CRGE is the foundation of Ethiopia's INDC. The energy sector, supported through CIF, is one of seven CRGE priority sectors. The proposed adaptation measures are based on the National Adaptation Programme of Action (NAPA) and the Ethiopia Programme of Adaptation to Climate Change.

The Government of Ethiopia received support from the Climate and Knowledge Development Network (CDKN) and the Global Green Growth Institute (GGGI) who were involved in the INDC development process. Multiple international development partners are cooperating with Ethiopia

on CRGE, the strategy underlying the INDC Stakeholder consultations were conducted to ensure quality of the INDC and Ministries have been very active in decentralized consultations.

4.1.2. Progress on National Adaption Plan (NAP)

Ethiopia launched their National Adaptation Plan (NAP-ETH) in September 2017, setting out priority actions for the country to prepare for the impacts of climate change. According to the Government of Ethiopia, the NAP-ETH seeks to “bring about transformational change in the country’s capacity to address the adverse consequence of climate change.” The NAP document will be informed by the CRGE through which the country aims to achieve middle-income economy status by 2025 while also achieving climate resilience and zero net greenhouse gas emissions. The strategic priorities of the NAP are to mainstream climate change adaptation into development policies, plans and strategies; build long-term capacities of institutional structures; implement effective and sustainable funding mechanisms; advance research and development in the area of climate change adaptation; and improve knowledge management.³⁵ The Ministry of Environment, Forests and Climate Change (MEFCC) has been the focal ministry for the Ethiopia’s NAP, coordinating consultations with other line ministries and sub-national stakeholders

The National Adaptation Plan focuses on agriculture, forestry, health, transport, power, industry, water, and urban sectors that are identified as most vulnerable. Within these sectors, 18 adaptation options have been identified for implementation at all level and across different development sectors, recognizing the considerable diversity in context and vulnerability across Ethiopia's regions and social groups.

Ethiopia's NAP initiation is part of its grand action of mainstreaming climate change mitigation and adaptation into its national development plans, in particular into its Growth and Transformation Plan (GTPII). The NAP has an annual USD 6 billion fund plan which is expected to be raised from a combination of financing sources, including public and private as well as domestic and international sources.

The NAP Global Network is working with MEFCC to support the NAP process

4.2. Institutional Coordination for climate change in Ethiopia

In 2013, the former Environmental Protection Authority and Ministry of Environmental Protection and Forests were combined to create the Ministry of Environment, Forests, and Climate Change (MEFCC). The MEFCC is the climate change focal point and responsible for implementing international conventions and agreements related to climate change, environment, and biodiversity. The MEFCC is responsible for developing environmental laws and standards, developing environmental strategies, supporting implementing agencies, preparing state of the environment reports, and monitoring and evaluating effectiveness. In terms of finance, the MEFCC sits on the CRGE Facility Management Committee and Chairs the CRGE Facility Technical Committee.

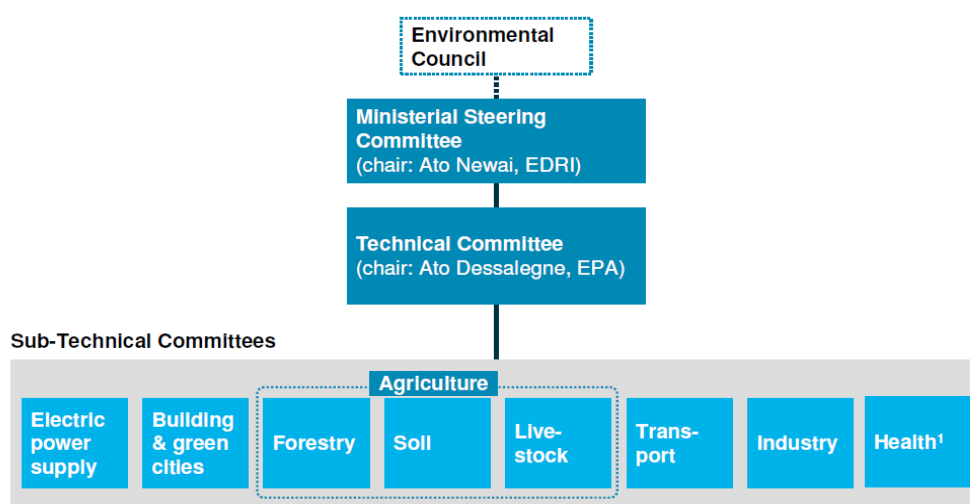
The CRGE is coordinated and overseen by the CRGE Ministerial Steering Committee (an initiative under the Prime Minister’s Office). CRGE units have been established in key implementing line ministries and regions to translate the strategy into sectoral programmes and investment plans. Federal (line ministries) and regional entities have been identified as national implementing entities that will be responsible for implementing programmes and investment plans in partnership with

³⁵ <http://napgloalnetwork.org/2017/09/ethiopia-launches-national-adaptation-plan-document/>

non-state actors where required. It is of paramount importance that the Government effectively coordinates these activities for the successful implementation of the CRGE. With respect to financing, the Government has established a funding mechanism as part of the CRGE facility to mobilize and disburse climate finance. This facility will provide financing for climate resilience programmes for building a green economy. The goal is to mobilize approximately US\$200 billion from national and international public and private sources over the next 20 years.

Institutional framework for implementation of the CRGE³⁶

PM's office's leadership and inter-ministerial approach ensure national commitment and alignment across government



The CRGE Facility has put in place guidelines which include; Sectoral Reduction Mechanism guidelines; sectors have also prepared investment plans and projects. The Steering and Technical committees convene regularly and capacity building at all levels is going on. The Measuring, Reporting and Verification (MRV) system for Agriculture and Industry sectors has been established and appropriate technology selection is ongoing.

Ministry of Finance and Economic Cooperation (MoFEC) (formerly Ministry of Finance and Economic Development, or MoFED) coordinates closely with the MEFCC to administer the CRGE Facility. It chairs the CRGE Management Committee and is the Facility Secretariat. It thus provides the financial management and administration expertise as well as playing a leading role in finance allocation decision-making for national and subnational climate finance. According to the Green Climate Fund, the MoFEC currently manages climate resilient development projects valued at \$400 million. The MoFEC is a National Implementing Entity (NIE) for the Adaptation Fund, Global Environment Facility (GEF) and Green Climate Fund (GCF) meaning it has met legal and fiduciary standards to receive finance intended for adaptation programs or projects.³⁷ The accreditation enables a direct access modality for Ethiopia to access climate finance and exercise greater national ownership in how that finance is used.

The Ministry of Agriculture (MoA) plays a prominent role in implementing the CRGE given how largely crop resilience and agricultural livelihoods are important to Ethiopia's green growth goals.

³⁶ CRGE, 2011

³⁷ Adaptation Fund: Implementing Entities; Accessed 01/08/2017. <https://www.adaptation-fund.org/apply-funding/implementing-entities/>

The MoA is divided into five sectors: Disaster Risk Management and Food Security, agricultural development, livestock, natural resources management, and extension. The policy goals of the Ministry are aligned with those of the CRGE, according to the CRGE Agriculture and Forests Strategy.

4.3. Policy and Institutional Gaps for Climate Change Mainstreaming

Climate change has clearly been mainstreamed within the national development planning process. The main policy instrument, the CRGE strategy, has been well designed for ease of implementation, with coherence across the two main elements of the strategy (mitigation and adaptation). The mitigation (or green economy) element began earlier and has been influential in informing the overall growth trajectory that aims to secure for Ethiopia a middle income status by 2025 in a carbon neutral way. However, the adaptation (or climate resilience) part of the strategy has developed more slowly and needs to be enhanced so as to secure the livelihoods of those most vulnerable to climate change.

The policy implementation process needs to put into consideration how best to secure the active participation of all stakeholders in the policy process so as to maximise the likelihood of active implementation of climate change programmes and projects. There is broad experience that demonstrates effective delivery of public programmes depend in large measure, on early involvement of all affected groups. Creating additional space for non-government actors in the present policy platforms will make a positive contribution.

The policy framework is silent on how it will promote transparency in climate finance delivery, which is a generally-held principle of public administration. The emphasis on performance-based approaches for the allocation of climate finance by the CRGE Facility represents an important opportunity in this regard. Developing a national system to track climate change spending on adaptation and mitigation within the federal budget could be a starting point. An entry point for the development of such a system could be through its integration with the GTP II planning and budgeting process. OECD and the South African Government have advanced climate finance tracking through development of a National Climate Change Response Database which is used to collect, collate, store, sort, analyse and report information relating to significant South African climate change response interventions. Collected information on projects included inter alia project description, timelines, budgets, targeted groups, location, funding organisation, host organisation, lead partner, type of intervention (research or project, mitigation or adaptation) and contact information³⁸. Country exchange and learning platforms could provide lessons that can be useful to improve climate finance tracking.

The Environment Policy mentions vulnerability of the country and the need for national action aimed at the management of climate risks and mobilization of financial support from the international community, there is no mention of the need for full integration of climate change adaptation and nationally appropriate mitigation measures in the environmental policy. This deficiency is largely because of the fact that the policy was crafted much before climate change has become high on the political agenda. Policy reviews in the future could consider integration of climate change to reinforce the climate resilience and green growth pathways.

Whereas the CRGE structures are working well at national level, the capacity of the regional and local institutions to discharge the national climate policy or climate finance delivery mandate still needs to be strengthened. At regional and local level, discussions with the bureau of environment indicated that there is a disjoint between the national and local level processes in relation to mainstreaming of climate change. Key issues included lack of capacity to translate the CRGE to inform the planning processes, plans and budgets as well as funding to facilitate the processes. This

³⁸ Gaylor, M.C, 2013. Tracking Climate Finance Inflows to South Africa

link will need continuous strengthening to achieve overall implementation of the CRGE from local to national levels, thus improving community resilience and enhancing low emission development.³⁹

Overall, the policy and institutional frame work in Ethiopia represents a tremendous opportunity to address issues of climate change mainstreaming and climate finance tracking. The institutional arrangements established by the CRGE strategy points to how government will administer the national response to climate change but needs to be reflected in actual plans and budgets and also measured to ascertain the impact of the programmes in relation to enhancing climate change resilience and green growth for Ethiopia in measurable terms.

5.0. Climate change financing for Ethiopia

The main frame work for climate finance in Ethiopia is through the CRGE Facility. The facility is a multi-donor trust fund created to mobilize and combine domestic and international sources of public and private finance to build institutions and implement the CRGE strategy. The intent is for the Facility to serve as the clearinghouse for domestic and international climate finance. Ethiopian Government, private sector, and civil society organizations can all apply for finance from the Facility. The Facility finances projects and plans in two ways: The Strategic Window finances the investment plans of line ministries and regional governments through the government's "iplan" process jointly or in parallel to the main budgeting process. The plans should mainstream climate activities and the goal is that this financing mechanism would shift from a grant-based approach to reward for performance. It is expected that these funds will be used to leverage additional financing and that financing needs to be disaggregated by source (public/private) and type of (grant/loan/guarantee). The second is the Responsive Window funds demand-driven projects raised by non-state actors, including civil society organizations, academics, and communities in partnership with government at the federal, regional, district, or community level. These projects should align with the CRGE generally and with relevant investment plans.⁴⁰

The CRGE strategy has called for annual spending of USD 7.5 billion. With federal budgetary resources for climate change relevant actions estimated to be in the order of USD 440 million per year, and international sources adding an uncertain amount that may be in the tens of USD million per year, there appears to be a major financing gap. Therefore, if the CRGE strategy is to be delivered, much more effort needs to be exerted to mobilise additional resources both domestically and externally.⁴¹ Increased financial support from the international community is needed to complement the significant domestic resources being allocated to climate change actions. International commitments on climate finance need to be realised. This is now a matter of urgency for Ethiopia, and for many other African States⁴²

Studies on Ethiopia's climate change spending (mitigation and adaptation) between 2008 and 2012 found that Climate change relevant expenditure has not been coded as such in the budget, making it difficult to track. There was also little information available regarding the scale of climate change spending that was occurring off-budget (i.e. spent outside of normal budgeting processes), which, according to the authors, weakens oversight. Ethiopia does have an official process for parliamentary reviews of budgets, but there are no requirements for agencies to respond to identified irregularities. Finally, the authors note that there is no mention of climate finance transparency in the Climate Resilient Green Economy Strategy (ODI, 2012; Eshetu & Bird, 2015)

³⁹ Irish Aid back to office report, 2016

⁴⁰ WRI, AFAI back ground notes, 2017

⁴¹ ODI, 2014

⁴² Addis Ababa University, 2015

The public expenditure analysis of the federal budget found that climate change relevant spending fluctuated quite considerably between 2008 and 2012, reflecting the start-up of major development projects. The estimated average annual percentage share of such expenditure over the four years was 15 percent of total government expenditure, representing 1.8 percent of GDP. Most climate change relevant spending over the four year period was found in investment programmes where responding to climate change was a secondary objective of the expenditure. This pattern of spending is consistent with a government resource prioritisation plan that focuses on economic development, whilst taking climate change into consideration. Significant investments were found in agriculture and infrastructure development, such as renewable energy generation (e.g. hydro, geothermal and wind power), to ensure food security and the promotion of industrial growth. However, this expenditure was found to have low budget credibility, with execution rates of between 25 and 35 percent, suggesting that many climate change related programmes are suffering from delays in implementation (Eshetu and Bird, 2015)

Current climate finance information is not available on the website of the Facility. The most recent budget information on the Ministry of Finance and Economic Cooperation’s site is from 2009. The UNDP MPTF site shows that the Facility has received \$1,693,032, all from the Government of Norway, as part of a \$2,620,739 overall commitment through the responsive window as of mid-2017. However, there is no available information on how this finance has been allocated domestically.

Financing for climate-relevant projects⁴³

Funder	Type	Project name	Amount	Link
Government of Norway	Bilateral	Forest sector development	\$2.62 million committed (\$1.69 million disbursed)	http://mptf.undp.org/factsheet/fund/3ET00?fund_status_month_to=12&fund_status_year_to=2017
World Bank (US and Norway)	Multilateral	Oromia Forested Landscape Project	\$18 million	http://allafrica.com/stories/20170530583.html
Adaptation Fund	Multilateral	Climate Smart integrated rural development project	9,987,910	https://www.adaptation-fund.org/project/climate-smart-integrated-rural-development-project/
Adaptation fund	Multilateral	Agriculture Climate Resilience Enhancement Initiative (Kenya, Ethiopia, and Uganda)	\$6,800,000 (across three countries)	https://www.adaptation-fund.org/project/agricultural-climate-resilience-enhancement-initiative-acrei-ethiopia-kenya-uganda/
GEF Least Developed Countries Fund	multilateral	CCA Growth: Implementing Climate Resilient and Green Economy plans in highland areas in Ethiopia	\$6,277,000 Cofinancing: \$10,450,000 Total: \$16,827,000	https://www.thegef.org/project/cca-growth-implementing-climate-resilient-and-green-economy-plans-highland-areas-ethiopia
GEF Trust Fund	Multilateral	Mainstreaming Incentives for Biodiversity Conservation in the Climate Resilient Green Economy Strategy (CRGE)	\$3,316,455 Cofinancing: \$16,000,000 Total: \$19,406,393	https://www.thegef.org/project/mainstreaming-incentives-biodiversity-conservation-climate-resilient-green-economy-strategy

⁴³ WRI AFAl report for Ethiopia, 2017

The Ethiopian Government’s \$50m climate resilience proposal was recently approved by the Green Climate Fund (GCF). The proposal, one of Africa’s largest direct access proposal focuses on sustained provision of water for potable and productive use, including the use of solar energy to power the water pumps, and improved land use management to increase ground water recharge and soil nutrient content. It is intended to change the livelihoods of more than 1 million people in highly vulnerable communities. The proposal entitled “Responding to the increasing risk of drought: building gender-responsive resilience of the most vulnerable communities” was developed by the Ethiopian Ministry of Finance and Economic Cooperation (MoFEC) with support from the Climate and Development Knowledge Network (CDKN). The funds will be channeled directly to government avoiding the use of multilateral banks or other international intermediaries. This means the money is being channeled through the GCF’s Direct Access Mechanism to the National Implementing Entity (NIE).

5.1. Ireland’s contribution to climate finance

In 2016, Ireland provided a total of € 14,178,725 to Ethiopia in climate finance through its bilateral aid programme. In addition, Ireland provided € 1,886,257 in 2016 in climate finance to projects in Ethiopia through its civil society programme. Climate relevant expenditure provided by Irish Aid to civil society organizations in 2016 was Rio marked and accounted for systematically for the first time, in cooperation with the project partners. Projects funded directly by Irish Aid under the bilateral aid programme include the Productive Safety Nets Programme, improving livelihoods and resilience through climate smart agriculture, support for rural livelihoods through dissemination of energy efficient cook stoves, and the promotion of sustainable community based seed production systems. Civil Society partners Concern, Trócaire, GOAL, Self Help Africa, Mísean Cara, and Vita are helping to build resilience to climate change through a wide range of projects including improvement of the asset base, resilience, and inclusiveness of extreme poor; increasing community access to and quality of water, sanitation and improved hygiene practices in targeted communities; and reducing hunger and poverty and promoting economic development by increasing smallholder production and return from enterprises⁴⁴.

Bilateral and CSO climate finance 2016 summary;

	Bilateral €	Civil Society
Climate Finance Adaptation (UNFCCC)	13,244,000	1,575,574
Climate Finance Mitigation (UNFCCC)	934,725	750
Climate Finance Cross-cutting (UNFCCC)	0	309,933
Biodiversity (UNCBD)	6,097,370	1,193,594
Desertification (UNCDD)	5,200,000	1,828,196
Disaster Risk Reduction (DRR)	10,700,000	N/A
Total Climate Finance	14,178,725	1,886,257

⁴⁴ Ethiopia Country Climate Action report (Irish Aid, 2017)

6.0 Donor Coordination and support in Ethiopia

There are two donor coordination levels in Ethiopia. The first one is the Development Assistance Group (DAG), comprising 30 bilateral and multilateral development agencies providing development co-operation to Ethiopia. The DAG was established in 2001 as a forum for donors to share and exchange information to foster meaningful dialogue with Government. The second level refers to "Joint Programming", a new collaborative approach in which the EU Delegation and Member States come together to define a common vision to address main challenges facing Ethiopia. There is still room to improve coordination. The strong Ethiopian ownership, together with good coordination, are keys to success.

According to the DAG, 2015 Profiles of 41 Development Partners in Ethiopia for the period 2009-2013, total development assistance to Ethiopia was USD 3.9 billion in 2013. ODA to Ethiopia has increased by 66% in real terms. The five largest providers of development assistance to Ethiopia are the World Bank, the United States, the United Kingdom, the African Development Bank, and the Global Fund.

It is also noted that there is marked decrease in the share of humanitarian aid. Whereas in 2005 humanitarian aid amounted to 20% of gross ODA and in 2009 17%, in 2013 it represented only 10%. This corresponds to a decline in the absolute volume of humanitarian assistance from around USD 700 million in 2009 to USD 400 million in 2013.

The move from humanitarian to development assistance reflects the fact that the country has built some resilience to an extent, which is attributed to the safety net programmes for the most vulnerable. Nonetheless, the humanitarian caseload is still significant, and often recurs in the same regional hotspots from one year to the next. This points to the presence of more systemic vulnerabilities which are likely to increase with climate variability and change, and requires to be addressed through development programming, taking into account reducing vulnerability and building resilience of the poor and vulnerable.

There is also increased share of development assistance provided in the form of concessional loans compared to grants. In 2004, loans made up only 14% of total development assistance, in 2009 they were 25%, and in 2013 the share of loans reached 32%. According to the World Bank/IMF debt sustainability exercise conducted in 2011/12, Ethiopia is able to assume external public debt at relatively low risk. Concessional loans from multilateral partners and increasingly from bilateral partners offer a way to expand Ethiopia's development assistance portfolio at a relatively low cost for providers of development assistance. As the country moves towards lower-middle income country status and accesses international financial markets (as demonstrated by Ethiopia's sale of Eurobonds last year and its plans to start an equities and secondary debt market), one would expect the ratio of ODA loans to grants to continue to increase.

The European Union (EU) supports the Government of Ethiopia mainly through the establishment of direct funding channels aiming at increasing the number of sectoral projects, which in the end make the real difference in fighting climate change. For instance, the planned Sector Budget Support to climate change and environment estimated to be between 32 and 40 million Euros is a funding facility that will allow Ethiopia to improve both the mitigation and adaptation policies included in the CRGE strategy. At the moment, the EU is funding more than 60 projects with the help of Member States, NGOs and international partners, and certainly hopes to increase its action in the country. However the EU needs to increase coordination between and with member States. Joint Programming is still at an early stage. There are efforts with EU partners to re-establish an EU Green Sector Platform that would further enhance cooperation among actors and areas of expertise. Some significant issues, such as rural development, food security, population growth, as well as

environmental degradation, need to be addressed simultaneously. The EU is sufficiently active in supporting Ethiopia to implement adaptation policies. The EU acts as a Co-Chair, together with the World Bank, in the Food Security and Rural Development Dialogue. In this dialogue, the EU is working with more than 30 partners to improve and create new adaptation policies.⁴⁵

There are other coordination programmes including the National Improved Cook stoves Program of Ethiopia (NICSP-Ethiopia), REDD plus initiatives among others. However, the general national level climate change coordination and policy dialogue platform is quite fragmented. Whereas Ethiopia has well-coordinated policies and plays a prominent role in the international scene, there are a lot of opportunities to strengthen implementation of the global and national commitments through local actions.

7.0 Ireland's Approach to Climate Change Adaptation

Ireland's policy for International Development, 'One World, One Future', and the Foreign Policy, 'The Global Island', prioritises action to address climate change for the poorest people in developing countries. Ireland places particular attention on reducing vulnerability to climate change in Least Developed Countries, recognising the importance of community based and local adaptation to climate change.

Ireland is investing in building capacity of staff in Irish Aid and in partner countries (both government and civil society organisations), to integrate climate change into development programmes and projects and to improve tracking and accountability on climate finance at the programme planning and appraisal stage. A Climate Change and Development Learning Platform was launched with the assistance of the International Institute for Environment and Development (IIED) to facilitate the sharing of information and lessons between Irish Aid staff, climate and development experts, and partners in developing countries. The Climate Learning Platform documents local experiences and uses the learning to inform countries decisions when designing programmes to address climate change, with a particular focus on integrating climate change into development planning. The Climate Learning Platform can be accessed through the Irish Aid website and via www.climatelearningplatform.org

The Climate Change and Development Learning Platform work in Ethiopia

Irish Aid in partnership with International Institute for Environment and Development (IIED) host an organised Climate Change and Development Learning Platform which focuses on research and capacity building. The initiative provides evidence and capacity for key partner countries to mainstream climate change into Irish Aid country programmes as well as publishing guidance notes and briefs on priority Irish Aid focus areas. The platform also links country level experiences to international policy frameworks. Details of the climate change work in Ethiopia can be accessed on <https://www.climatelearningplatform.org/key-partner-countries/ethiopia>

⁴⁵ EU quarterly newsletter, October 2016

Case Study Research on Integrated Watershed Management with Climate Smart Agriculture in Gegera Water Shed

The Gegera Watershed Rehabilitation case study was prepared with the objective of assessing and presenting the practical work implemented through the Enhancing Integrated Watershed Management with Climate Smart Agriculture project at Gegera Watershed in Tigray, northern



Ethiopia. The Government of Ireland, through the Irish Aid development programme, funded the project. The World Agroforestry Centre (ICRAF), in partnership with its local institutions and Watershed communities, was the implementing organization. The

project had been implemented in this Watershed since August 2014. Irish Aid commissioned International Institute for Environment and Development (IIED) to conduct this case study, and IIED worked in collaboration with Echnoserve as a local partner. The primary results of the study include analysis on how the climate risk management was undertaken by different stakeholders and how it has improved community adaptation in the face of adverse climate change, and how community based adaptation practices affected the environmental resources system and how the communities manage and properly utilize the environmental ecosystem services through this innovative CSA approach.

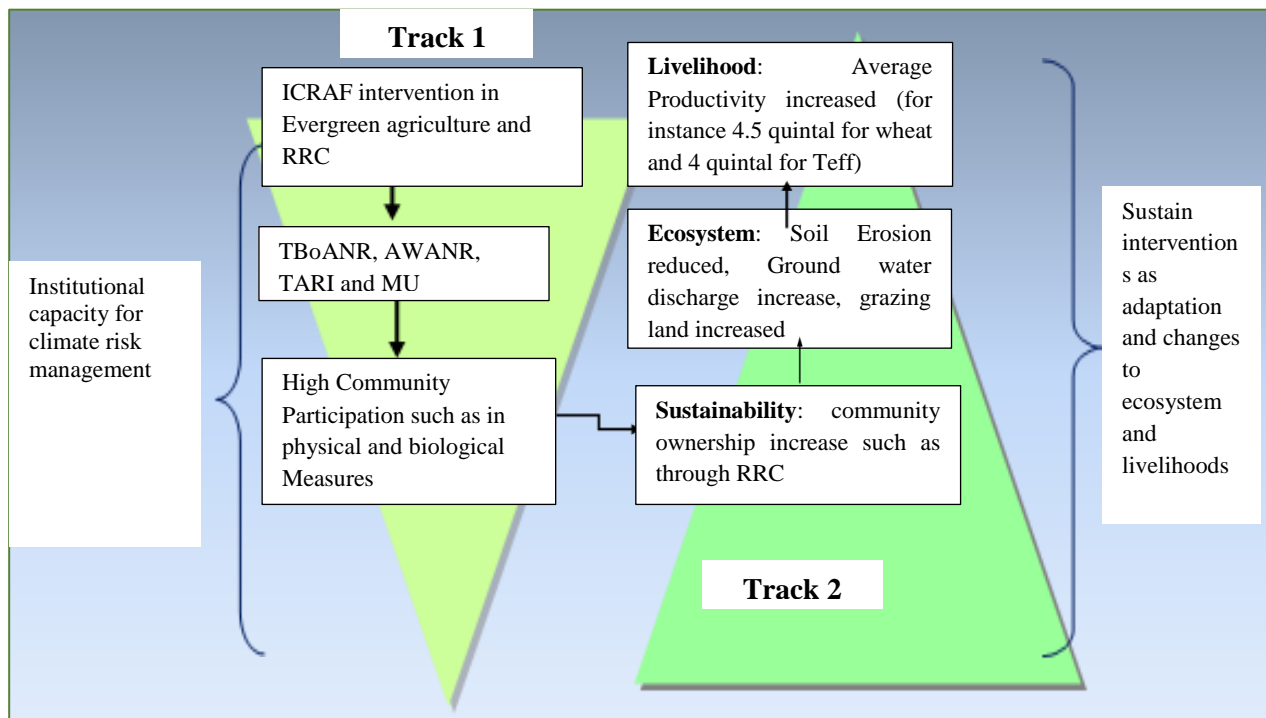
Using the Tracking Adaptation and Measuring Development Framework (TAMD)⁴⁶, the case study results showed that the Gegera Watershed Rehabilitation project has been successful in creating sustainable community-based adaptation practices with significant positive results. These impacts were perceived from the outputs and outcomes of the CSA interventions including enhancing productivity, sustainability and resilience of degraded landscapes through integrating conservation, converting gullies from threats to livelihood opportunities, transforming farming systems and integrating and strengthening Rural Resource Centre (RRC) as bankable youth- and women-led small scale business for providing livelihood/business opportunities to unemployed/landless youth through technical and agricultural/forest inputs support. There were also major positive changes in the ecosystem services, livelihood and environmental resources management.

Assessment on Regeneration and GHG Emission Reduction of Natural Resources Management Measures for Lake Hawassa Watershed Project

The 'Improving Smallholder Livelihoods and Resilience in the SNNPR (Southern Nations Nationalities and Peoples' Region) and Oromia Regions through climate smart agricultural economic development' is a consortium project funded by Irish Aid and managed by SOS Sahel, Vita, Self-Help Africa and Farm Africa. The project aims to alleviate poverty and foster resilient/sustainable livelihoods for vulnerable Smallholder Farmers (SHF) through climate-smart agricultural and economic development.

⁴⁶ The TAMD framework assesses how adaptation contributes to development and how development interventions enable adaptation to climate effects. <http://www.iied.org/tracking-adaptation-measuring-development-tamd>

The International Institute for Environment and Development (IIED) and Echnoserve Consulting are conducting a longitudinal study (2015-2018) in the project area of Lake Hawassa watersheds. The study aims to better understand the effectiveness of key project dimensions, such as building climate resilience in the livelihoods of SHF around watersheds, for the purposes of institutional learning and the efficacy of future programming. The longitudinal study was designed to include different components to assess the impacts of natural resources or watershed management measures on vegetation regeneration and its related GHG emission reduction, and mapping natural resources in Hawassa Zuria and Wondo Gente Woreda and kebeles.



Improving Agro-meteorological information for small-scale agricultural production in Tigray and SNNP – Irish Aid/WMO

Ireland and the World Meteorology organisation (WMO) entered into an MoU linked to the food security and Global Framework for Climate Services (GFCS) which is a global partnership of governments and organizations that produce and use climate information and services. It seeks to enable researchers and the producers and users of information to join forces to improve the quality and quantity of climate services worldwide, particularly in developing countries. The GFCS seeks to build on continued improvements



in climate forecasts and climate change scenarios to expand access to the best available climate data and information. Policymakers, planners, investors and vulnerable communities need climate information in user-friendly formats so that they can prepare for expected trends and changes. Depending on the user's needs, these data and information products may be combined with non-climate data, such as agricultural production, health trends, population distributions in high-risk areas, road and infrastructure maps for the delivery of goods, and other socio-economic variables. Ethiopia was selected as a pilot for the above project

The WMO is implementing the project in partnership with the National Meteorology Agency of Ethiopia (NMAE). The project has strengthened the capacity of Regional Meteorology Service Centres in Tigray and SNNP on the production of localized weather information at regional level.



Farmers have been given plastic rain gauges and trained on taking daily recordings, which NMAE interprets into advisories

The project has enhanced institutional linkages between Regional Met Service Centers (who are providing and analyzing the weather information), Bureau of Agriculture and Natural Resource (offering extension services), Agricultural Research Institutions (TARI & SARI offering research services on crop varieties relevant for the seasonal forecast, soil tests etc) and universities (Mekelle and Hawasa engaged with the impact assessments). This relationship has proved that support to agriculture is not only about climate and weather information, but also better farming methods, better crop varieties and soil types. The first impact assessment conducted by Mekelle University in the first year indicated that user farmers obtained a yield increment of between 2.4% to 34.4% compared to non-users

The additional non climate services have also proven useful. The NMAE is working with the regional bureaus of agriculture and the regional agriculture research institutes to provide extension services to beneficiary farmers in terms training on better cropping methods that promote soil and water conservation, providing seed that is suitable for the weather conditions forecasted, and research into soil quality and crop varieties. Farmers have attested that access to seed tailored to the

soils and weather conditions as well as access to fertilisers and training in better cropping methods have improved the crop yields and quality. This is a new approach and support that they have not received before. Capacity building and learning has been promoted by the project both within NMAE and at farmer level. NMAE has developed a climate guide for extension workers, to support extension services on key terminologies and interpretation of weather information. Farmers were also trained by the regional bureaus of agriculture, using Farmer Training Centres with onsite demonstration farms, focusing on cropping methods and using the plastic rain gauges to monitor precipitation trends.

7.1. Irish Aid climate change bilateral programme in Ethiopia

The Irish Aid Country Strategy for Ethiopia for 2014-2018 aims to support Ethiopia's growth and poverty reduction plans so that the poor benefit from, and contribute to, equitable economic, social and environmental development. The key outcomes focus on increasing household's resilience to economic, social, and environmental stresses and shocks. Irish Aid's theory of change is hinged on support that includes relief, climate-smart public works, social transfer systems and enhanced livelihoods for a sustained reduction in vulnerability and to provide the platform from which poor people can benefit and participate in economic growth. The provision of social protection-based safety nets (stop gapped as needs be with relief support) is effectively a precondition for the type of risk taking and investment needed to build livelihoods. International evidence illustrates that social safety nets can also contribute to better nutrition and health status of the poor.

Social Protection and Climate Change

Irish Aid focuses on social protection as an important policy instrument in partner countries to reduce extreme poverty. Social protection shelters the poorest and most vulnerable from natural and man-made disasters, it increases and improves the involvement of poor women and men in

Why Focus on Social Protection?

Builds and prevents eroding of assets and capacities at individual, community and national levels by stresses and inequalities.

Relevant social protection tools, in particular well designed, delivered and targeted social cash transfers, can support poor people in building their resilience to stresses and develop less risky coping mechanisms

Social protection is relevant for humanitarian crises -the countries most in need of humanitarian assistance are often the same as those with most pressing needs for social protection.

An increase in social protection spending, through easing the income constraint, can have the knock-on effect of making spending in other sectors, such as health and education, more efficient

Irish Aid, 2017. (Social Protection Policy)

economic activity, and it contributes to equity and social accountability. In particular Irish Aid recognises that social protection can contribute to building resilience, improving access to essential services, unlocking productive capacity, and promoting social cohesion. Social protection programmes are affordable, even in the poorest countries, and as a direct transfer from State to citizen represent good value for money. Priority is given to appropriate and sustainable social protection programmes that address inequality by focusing on the very poorest households, women and children in particular, and improving their access to basic services.⁴⁷

Ireland commits to integrate natural disaster and climate change risk management and vulnerability

⁴⁷ Irish Aid, 2017. Social Protection Strategy

assessments when planning and implementing bilateral country programmes. This will include increasing investment in multi-hazard risk analyses, early warning systems, preparedness and disaster risk reduction across our portfolio, with measures to ensure that the specific needs and capacities of women and children are considered.

The Irish Aid Ethiopia programme recognises that social protection based safety net mechanisms, such as PSNP contribute towards a reduction in vulnerability and serve as a foundation for building assets and resilience. However, additional targeted pro-poor agriculture and natural resource programming is required to assist the most vulnerable to build resilient livelihoods and participate in the ongoing economic development of Ethiopia. Irish Aid has provided significant financial and technical support to the PSNP programme and was actively engaged in the design of the next phase of the PSNP which was launched in 2015. As part of this process, particular support is provided for greater engagement with the broader social protection environment (including the Ministry of Labour and Social Affairs) and with those working on disaster risk management. Gender and HIV and AIDS are considered as key factors in the targeting of cash transfers and in the design of public works programmes. Nutrition is included in the design and results framework of the programme. The PSNP has continued to deliver on environment and climate related results and policy engagement have been explored through the established dialogue structure of the PSNP programme, the national Social Protection Platform, and relevant humanitarian and disaster risk-management forums.

The WB has explored pilots and case studies on linkages between climate change and social protection and have published a paper on Climate Change Mitigation Potential of Ethiopia's Productive Safety-Net Program (PSNP). The study concludes that PSNP's climate-smart land management and ecosystem restoration interventions deliver climate-change mitigation principally by sequestering carbon in soils and biomass. This opens a new line of thinking and opportunity where food-security interventions that target underlying drivers of food insecurity such as ecosystem and land degradation become a vehicle for climate-change mitigation. The findings also show that food security safety net programs, despite not being initially intended to provide climate change mitigation, are nonetheless climate smart, achieving mitigation impacts comparable to the largest carbon projects currently implemented in the agriculture forestry and other land use sector globally.

The World Bank and DFID funded the Climate Smart Initiative (CSI) to strengthen two important Government of Ethiopia food security programmes in Ethiopia – the Productive Safety Net Programme (PSNP) and the Household Asset Building Programme (HABP). The CSI piloted approaches to mainstreaming climate change within significant ongoing implementation. The PSNP's Climate Smart Initiative (CSI) sought to improve how climate issues are addressed through the PSNP 4. The CSI was an action research programme carried out by a consortium of agencies under the leadership of CARE International (with FARM Africa, Mercy Corps, ORDA, and REST). The initiative aimed to systematically integrate the implications of climate change into the PSNP's plans and activities by supporting climate-smart analysis and planning processes at watershed level, piloting climate-smart activities, identifying and synthesising learning to inform integration of climate change in PSNP 4 and wider policy debates.

Working through existing PSNP structures, the CSI developed and piloted a variety of climate-smart processes and approaches across 212 watersheds in six regions – Afar, Amhara, Oromia, SNNPR, Somali, and Tigray – between July 2013 and September 2015. The CSI addressed a broad range of issues and processes that are considered critical to the integration of climate-smart approaches within the PSNP⁴⁸. This pilot project lays a background and evidence, best practices and lessons for integrating climate change into development programmes.

⁴⁸Toward a climate-smart Productive Safety Net Programme (PSNP) in Ethiopia

Enhancing climate resilience, food and nutrition security

The programme supports the economic empowerment of poor farmers, especially women farmers, and female headed households through specific and climate-smart value chains through partners such as SoS Sahel, FARM Africa and the regional bureaus of agriculture. Complementing the support to natural resources through PSNP public works, the programme supports reforestation of water catchments. The facilitation of regional Government collaboration is used as well as exchange and learning with NGOs on issues such as improved seed systems, viable value chains, and improved research into use approaches including meteorological data. Throughout this work, Irish Aid endeavours to generate and share evidence based learning to inform regional responses to the federal Climate Resilient Green Economy initiative. The Irish Embassy works closely with Head Quarter supported organisations working on rural development and humanitarian response including GOAL, Concern and Trócaire, Misesan Cara, Self Help Africa, Vita and Farm Radio International in order to learn from and capitalise on programmatic linkages. Irish Aid also engages with and supports relevant federal level livelihoods programmes.

Promotion and dissemination of improved Energy Saving cook stoves

Irish Aid has taken the opportunity to green the health sector. Irish Aid is supporting the Energising Development (EnDev) Programme to distribute 33,675 improved cook stoves to rural households. This has contributed to a reduction of greenhouse gas emissions equivalent to 180,260 tons of CO₂ and a reduction of indoor pollution. Solar energy and water harvesting systems have been provided in rural health centres, recognising the positive impact clean energy has on health outcomes at household level and piloting the provision of energy efficient cook-stoves and simple solar energy for mothers with new born children who have attended the health facilities. The intervention is focusing more on women in terms of skills development for them to make the stoves. The initiative is also linked to PSNP stove for work, transport subsidies, and to micro finance (money market to avail business credit to beneficiaries). From beneficiary testimonies, energy efficient cook stoves have contributed to reduced workload for women, reduced expenditure on energy sources, improved health for women, reduced natural resource degradation/deforestation and woodlots have been adopted by many beneficiary households

Humanitarian Response

Ethiopia has continued experiencing shocks and stresses that require humanitarian support, worsened by the influx of refugees over the recent years. Irish Aid contributes to the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) managed Humanitarian Response Fund. This fund continues to perform well and is responding effectively to emerging relief needs. Ireland's total humanitarian assistance to the Ethiopia crisis since 2012 amounts to over €18 million, including €6.65 million in 2016, and €2.6 million to date in 2017. The vast majority of this has been provided through the bilateral country programme, and some Irish NGOs have also received smaller amounts of funding through Humanitarian Unit's financing mechanisms, including the Humanitarian Programme Plan (HPP) and the Emergency Response Fund Scheme (ERFS). The Embassy of Ireland is engaged in significant advocacy in conjunction with partners in country to ensure that food and nutrition pipelines are not broken and that general food distributions continue. Advocacy has also been around increasing Government and regional resources for addressing critical needs. Significant engagement has also been undertaken with NGO partners on the ground encouraging them to respond to calls from Pooled Funds and to ensure full use of Irish NGO funding mechanisms.

8.0 Climate change implications for development programming

- The predicted decrease in annual rainfall is affecting all seasons, as well as the temperature rise which will affect the agriculture sector specifically among others. Crop production remains the leading driver of growth in the agriculture sector. Animal farming and hunting experienced negative growth in 2015/16 because of the drought. The changing rainfall patterns caused by El Niño and La Niña are expected to continuously reduce agricultural productivity. With projected increase in temperature and uncertainty in rainfall patterns Ethiopia's agricultural programmes will need to intentionally integrate climate risk management to reduce risks and shocks as a result of climate related hazards
- Strengthening of weather and climate services and improving use of agro meteorological advisories for the agricultural community. Climate information needs to be institutionalised and integrated into policy making, development planning and implementation, with focus on short term and long term time scales to guide planning and investment. Investment in generating and disseminating accurate, timely and reliable weather and climate information will be important to inform different sector adaptation and climate risk management plans and decisions regarding changes in climate.
- Decrease in agriculture production and productivity will have serious negative impacts on food security and nutrition. According to FAO/WFP, 2012, children who were born in an area affected by a disaster are 35.5% more likely to be malnourished; they are also 41% more likely to be stunted. Over the past four years between 2.2 and 6.4 million additional people were reported to be food insecure or not able to meet their food needs in the short term due to transitional factors. Most are temporarily dependent on relief food assistance. Climate-related shocks such as droughts and floods will continue to affect the ability of households to meet their food requirements leading to food insecurity. There is need to strengthen early warning systems, water harvesting, increasing water use efficiency and exploring weather index based insurance schemes as part of climate risk management.
- The majority of Ethiopia's country emissions are from livestock (42%) and deforestation (37%) therefore reduction goals are focused on Agriculture, Forestry, and Other Land Use (AFOLU). According to Ethiopia's Second National Communication (2015), the largest contributors to future GHG emissions will be agriculture (emissions are expected to reach 70-160 MtCO₂e in 2030) and the industry sector (50-70 MtCO₂e in 2030). There is need therefore to focus on a low carbon development path, while addressing climate risks and focusing on inclusive economic models that can increase incomes for the poor, especially women and the youth.
- Climate change will affect those that are already vulnerable especially women, female headed households, children, the chronically sick and the elderly. There is need to target the most vulnerable. All rural livelihood systems in Ethiopia are highly sensitive to climate given the dependence of cropping, pastoral and agro-pastoral practices. Strengthening livelihood options and income diversification for the poor will be important to build capacity and resilience against more intense climate-related risks
- Capacity building and strengthening of Government structures at national and sub national levels to better analyse and anticipate risks will be important to improve sustainable development, planning for uncertainties, managing risks and reducing vulnerabilities resulting from climate change and disaster impacts.

- Development programmes should systematically integrate climate change adaptation and support complementary livelihood and adaptation goals as well as promote environmental protection measures such as soil and water conservation among others
- Gender analysis should be done across all climate change adaptation programmes to understand the different capacities and vulnerabilities of women and men, boys and girls and ensure they are participating in climate decision making and that their vulnerabilities are reduced.
- Support to growth of agro-processing industries through direct support for technology transfer and strengthening production capacities in the private sector should be strengthened as an alternative for job creation and improving incomes for the poor.
- Understanding shifts in agro ecological zoning is important to support promotion of suitable crops and linking the small holder farmers to markets through value chain approach and private sector engagement

References

Adaptation Fund: Implementing Entities; Accessed June 2, 2017. <https://www.adaptation-fund.org/apply-funding/implementing-entities/>

AfDB, OECD, UNDP, 2017. Africa Economic Outlook **Ethiopia**, Agricultural Development Economics Division, FAO, Rome

Alebachew, A. and Woldeamlak B, 2011. Climate Change Country Assessment Report for Ethiopia

Climate Action Tracker, 2016. <http://climateactiontracker.org/countries/ethiopia.html> (Accessed 24/07/2017)

Daron, JD (2014). Regional Climate Messages: East Africa. Scientific report from the CARIAA Adaptation at Scale in Semi-Arid Regions (ASSAR) Project, December 2014.

Development Assistance Group, 2015. Profiles of 41 Development Partners in Ethiopia for the period 2009-2013

Dinku, T., Sharoff, J., 2016. Partnerships for Improving Climate Data Availability, Accessibility, and Utility. Ethiopia National Meteorological Agency, International Research Institute for Climate and Society, University of Reading

Edward Batte Sennoga, Admit Wondifraw Zerihun, James Wakiaga, Haile Kibret

Eshetu, Z., Bird, N., 2015. Climate change spending in Ethiopia; Recommendations to bridge the funding gap for climate financing in Ethiopia

Eshetu, Z., Simane, B., Tebeje, G., Negatu, W., Amsalu, A., Berhanu, A., Bird, N., Welham, B., Canales Trujillo, N. (2014) "Climate finance in Ethiopia" Overseas Development Institute London and Climate Science Center, Addis Ababa.

Eshetu, Z., Simane, B., Tebeje, G., Negatu, W., Amsalu, A., Berhanu, A., Bird, N., Welham, B., Canales Trujillo, N. (2014) "Climate finance in Ethiopia" *Overseas Development Institute* London and *Climate Science Center*, Addis Ababa.

Eshetu, Z., Simane, B., Tebeje, G., Negatu, W., Amsalu, A., Berhanu, A., Bird, N., Welham, B., Canales Trujillo, N. (2014) "Climate finance in Ethiopia" *Overseas Development Institute* London and *Climate Science Center*, Addis Ababa.

Federal Democratic Republic of Ethiopia (2011) "Ethiopia's Climate Resilient Green Economy." <http://www.undp.org/content/dam/ethiopia/docs/Ethiopia%20CRGE.pdf>

Federal Democratic Republic of Ethiopia, (2007) Climate Change National Adaptation Programme of Action of Ethiopia. http://www.adaptation-undp.org/sites/default/files/downloads/ethiopia_napa.pdf

Federal Democratic Republic of Ethiopia, Federal Planning Commission (2016), "Growth and Transformation Plan II: 2015/16-2019/20"

Federal Democratic Republic of Ethiopia, Ministry of Environment and Forests (2016) "Ethiopia's Second National Communication to the UNFCCC." <http://unfccc.int/resource/docs/natc/ethnc2.pdf>

Feleke, G.F., 2015. Assessing Weather Forecasting Needs of Smallholder Farmers for Climate Change Adaptation in the Central Rift Valley of Ethiopia

Gaylor, M.C., 2013. Tracking Climate Finance Inflows to South Africa

Gebrehiwot, T., and van der Veen, A. (2013). *Assessing the evidence of climate variability in the northern part of Ethiopia*. Journal of Development and Agricultural Economics, 5, 3, 104-119.

Gebreselassie, S. et al, 2015. Economics of Land Degradation and Improvement in Ethiopia
GFDRR, 2013. Country Program Update May 2013

Global Health Observatory, data repository, World Health Organization, 2012.

Government of Ethiopia (2015). “Intended Nationally Determined Contribution of the Federal Democratic Republic of Ethiopia”.

<http://www4.unfccc.int/ndcregistry/PublishedDocuments/Ethiopia%20First/INDC-Ethiopia-100615.pdf>

Grantham Institute, (2010) “Ethiopian Programme of Adaptation to Climate Change”

<http://www.lse.ac.uk/GranthamInstitute/law/ethiopian-programme-of-adaptation-to-climate-change-epacc/>

Hagos S, Lunde T, Mariam DH, Woldehanna T, Lindtjorn B, 2014. Climate change, crop production and child under nutrition in Ethiopia; a longitudinal panel study. BMC Public Health. 2014 Aug 27; 14:884. doi: 10.1186/1471-2458-14-884.

Herman, M., 2016. Women and Climatic Changes in Ethiopia: A Gendered Assessment

Intergovernmental Panel on Climate Change (IPCC), 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Summary for Policymakers. Fifth Assessment Report (WGII AR5).

Jeremy Lind, Alastair Strickland, Lars Otto Naess, Rachel Sabates-Wheeler, Isobel Birch, Addis Hailemichael, Sarah Kohnstamm, and Mulugeta Tefera, 2016. Strengthening resilience in a changing climate; toward a climate-smart Productive Safety Net Programme (PSNP) in Ethiopia

Irish Aid, 2016. Briefing note; Building resilience

Korecha, D., 2014. The current methods and techniques on short, medium and long-range climate prediction in Ethiopia. Meteorological Forecast and Early Warning Directorate

Kreft, S., Eckstein, D., and Melchior, I., 2015. GLOBAL CLIMATE RISK INDEX 2017. Who Suffers Most From Extreme Weather Events? Weather-related Loss Events in 2015 and 1996 to 2015

Krishnamurthy, P.,K., Kirsty, L., Choularton, R.,J, 2012. Climate impacts on food security and nutrition

Mahoo H, Radeny M, Kinyangi J, Cramer L, eds. 2013. Climate change vulnerability and risk assessment of agriculture and food security in Ethiopia: which way forward? CCAFS Working Paper No. 59. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

McSweeney, C., New, C., and Lizcano, D. 2010. UNDP Climate Change Country Profiles

Nachmany, M, Fankhauser, S. et al, 2015. Climate Change Legislation in Ethiopia; the 2015 Global Climate Legislation Study. A Review of Climate Change Legislation in 99 Countries

National Meteorological Agency, 2015. Guide to the use of Weather and Climate Information for agricultural practices over selected district of Tigray, Ethiopia

NEPAD, 2012. Ethiopia consultation report; African Gender, Climate Change and Agriculture Support Programme (GCCASP)

Oxfam, 2010. The rain doesn't come on time anymore; Poverty, Vulnerability and Climate Variability in Ethiopia

Tamene, L.,Vlek, P.L.G, 2008. Soil erosion studies in North Ethiopia

Tesfa, Belachew (2013) Benefit of Grand Ethiopian Renaissance Dam Project (GERDP) for Sudan and Egypt. Discussion Paper. EIPSA Communicating Article: Energy, Water, Environment & Economic, Online. <http://eprints.hud.ac.uk/19305/>

United Nations, 2015. *The World's Women 2015: Trends and Statistics*.
New York: United Nations, Department of Economic and Social Affairs, Statistics Division.
Sales No. E.15.XVII.8.

UNDP Multi-Partner Trust Fund Gateway “Climate Resilient Green Economy Facility” Accessed 03/08/2017. <http://mptf.undp.org/factsheet/fund/3ET00>

UNDP Multi-partner Trust Fund Office: Ethiopia; “Ethiopia Climate-resilient Green Economy Facility,” http://mptf.undp.org/factsheet/fund/3ET00?fund_status_month_to=12&fund_status_year_to=2017

UNDP, 2014. National Human Development Report for Ethiopia

UNDP, 2017. Human Development Report

United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, DVD Edition.

USAID, 2012. Climate change adaptation in Ethiopia

USAID, 2016. Analysis of Intended Nationally Determined Contributions (INDCs)

WFP, 2013. Climate risk and food security in Ethiopia: Analysis of climate impacts on food security and livelihoods

Woldeamlak, B. (2009) Rainwater Harvesting as a Livelihood Strategy in the Drought-Prone Areas of the Amhara Regions of Ethiopia. Addis Ababa: Organization for Social Science Research in Southern and Eastern and Southern Africa.

Woolf, D., Jirka, S., Milne, E., Easter, M., DeGloria, S., Solomon, D., & Lehmann, J. 2015. “Climate Change Mitigation Potential of Ethiopia’s Productive Safety-Net Program (PSNP)”. A World Bank Climate Smart Initiative (CSI) Report. Cornell University. <https://ecommons.cornell.edu/handle/1813/41296>

World Bank, 2010. Economics of Adaptation to Climate Change

World Health Organisation, 2015. Climate and Health Country Profile – Ethiopia

Yohannes Yihdego, Alamgir Khalil & Hilmi S. Salem, 2017. Nile River’s Basin Dispute: Perspectives of the Grand Ethiopian Renaissance Dam (GERD)
Global Journal of HUMAN-SOCIAL SCIENCE: Management Volume 17 Issue 2 Version 1.0 Year 2017