Federal Ministry of Health

National Health Adaptation Plan to Climate Change

(2017-2020)

August, 2017
Addis Ababa, Ethiopia

Acknowledgement

The FMOH expresses its gratitude to WHO/DFID in initiating this project, providing close technical support by recruiting technical assistant and providing financial assistance in developing this H-NAP and the preceding National Framework and Health Vulnerability and Adaptation Assessment report which were inputs to develop the H-NAP. FMOH also expresses its deep gratitude goes to health leadership including respective regional health bureau heads and deputy heads for their valuable comment on the draft of this H-NAP. FMOH also acknowledge the contribution of regional health bureau experts in further developing this H-NAPby discussing its draft and forwarding constructive comments. Finally, we express our appreciation to the following national climate change and health technical working group members and their affiliated organizations for their frequent discussions and comments in developing this H-NAP.

Abate Benti	FMOH
AychewAgegnehu	FMOLSA
BalewYibel	FMOWIE
AlemMekonen	PHE-Ethiopia
DagnewTadess	FMOH
Dr. Kebede Etana	FMOH
ElzabethDebebe	FMOH
FikaduSahle	FMOUDHC
TolessaBenti	FMOANR
Goitom G/medhin	WHO/FMOH
Hamsalegenet W/senbet	FMOEFCC
AdinoEyassu	FMOI
Zelalem Kebede	FMOYS
Osman Yeha	WHO/FMOWIE
Samson Wakuma	AAU
Waltaji Terfa	WHO
Yared Tadesse	FMOH
MisganawTewachew	FMOH
AbirehamMisganaw	FMOH
Dr. Zufan Abera	FMOH

Acronyms

AWD	Acute Watery Diarrhoea
BPR	Business Process Re-engineering
CLTSH	Community Led Total Sanitation and Hygiene
CRGE	Climate Resilient Green Economy
CSA	Central Statistics Agency
COP_{21}	21stConference of Parties
CRWSP	Climate Resilient Water Safety Plan
DHS	Demographic and Health Survey
DRMC	Disaster Risk Management Commission
EIA	Environmental Impact Assessment
EMIS	Ethiopia Malaria Indicators Survey
FBD	Finance and Procurement Directorate
FDRE	Federal Democratic Republic Ethiopia
FEPA	Federal Environmental Protection Authority
EPHI	Ethiopian Public Health Institute
ESPA+	Ethiopian Service Provision Assessment plus Census
FMOH	Federal Ministry of Health
GCMS	Gas Chromatography Mass Spectrometry
GHGs	Green House Gases
GoE	Government of Ethiopia
HAPCO	HIV/AIDS Prevention and Control Office
HCs	Health Centers
HDAs	Health Development Armies
HEP	Health Extension Programme
HEPHSD	Health Extension and Primary Health Service Directorate
HHs	Households
HIA	Health Insurance Agency
HID	Health Infrastructure Directorate
HMIS	Health Management Information System
H-NAP	Health component of National Adaptation Plan
HPs	Health Posts
HRD	Human Resource Directorate
HSTP	Health Sector Transformation Plan
ICSU	International Council for Science
IDSR	Integrated Disease Surveillance and Response
ISSC	International Social Science Council
IPCC	Inter-Governments Panel of Convention on Climate
LLIN	Long Lasting Impregnated Net
MoANR	Ministry of Agriculture and Natural Resources
MCHD	Mother and Child Health Directorate
MDG	Millennium Development Goals
MOE	Ministry of Education
MoEFCC	Ministry of Environment, Forest and Climate Change
MoST	Ministry of Science and Technology
MoT	Ministry of Transport

MoWIE	Ministry of Water, Irrigation and Electricity
MoUDH	Ministry of Urban Development and Housing
MoYS	Ministry of Youth and Sport
MSD	Medical Service Directorate
MTOT	Master Training of Trainers
NA	Not Available
NAPA	National Adaptation Programme of Action
NBBS	Nation Blood Bank Service
NMA	National Metrology Agency
NPC	National Planning Commission
PHEM	Public Health Emergency Management
PSNP	Productive Safety Net Programme
OGCA	Office of Government Communication Affairs
RHBs	Regional Health Bureaus
SDG	Sustainable Development Goals
SLCPs	Short-Lived Climate Pollutants
SNNP	South Nation, Nationalities and People
SSD	Special Service Directorate
TOT	Training of Trainers
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children Fund
WaSH	Water, Sanitation and Hygiene
WHO	World Health Organization

Definitions

A1B:a scenario defined by IPCC 3rd that assume future world economic growth will very rapid, global population that peaks in mid-century and declines thereafter, and the energy system is balanced and not relying too heavily on one particular energy source, on the assumption that similar improvement rates apply to all energy supply and end-use technologies

Adaptation:adjustments in human and natural systems in response to actual or expected climatic variation, with a view to moderating harm or exploiting beneficial opportunities

Buildingcodes:series of ordinances enacted by a state or local governmental entityby establishing mi nimumrequirements that must bemet in the construction and maintenance of buildings.

Climate Change: changes in climate characteristics, including temperature, humidity, rainfall, wind, and severe weather events over long term periods

Climate Sensitive Diseases: diseases which fluctuates with climate variability

Gas chromatography mass spectrometry (GCMS):is an analytical method that combines the features of gas-chromatography and mass spectrometry to identify different substances within a test sample. GCMs estimates of mean annual precipitation and temperature and the standard deviation of annual precipitation are compared against observed estimates.

Faeco-Oral Transmission:is a route of transmission of a disease, when pathogens in fecal particles passing from one host are introduced into the oral cavity of another host.

Global Warming: the overall warming of the planet, based on average temperature over the entire surface of the Earth

Heat Stress: When the body is unable to cool itself by sweating, several heat-induced illnesses such as heat cramps, heat exhaustion and the more severe heat stroke can occur

Heat Stroke: is the most serious disorder associated with **heat stress**. It occurs when the body's temperature regulation fails and body temperature rises to critical levels. It is a medical emergency that can lead to death

Malnutrition: refers to deficiencies of energy and/or nutrients which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals).

Mitigation: efforts to reduce/prevent emission of greenhouse gases (GHGs) or to enhance their removal from the atmosphere by sinks

Population Pressure: the sum of the factors (as increase in numbers or excessive food consumption) within a population that reduce the ability of an environment to support the population and that therefore tend to result in migration and expansion of range or in extinction or decline of the population

Resilience: the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change

Stunting: is the impaired growth and development that children experience from poor nutrition, repeated infection, and inadequate psychosocial stimulation. Children are defined as stunted if their height-for-age is more than two standard deviations below the WHO Child Growth Standards median.

Vulnerability: the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extreme weather

Weather: the fluctuation of temperature, humidity and wind within short period of time

Preface

Climate variability and change is being visible all over the world. The adverse effects of climate change are all round and top issues globally. If we are not in a position to tackle climate change and its effect in integrated and cooperative manner, it might ruin the social, economic and political achievements we gained so far. Climate Resilient Green Economy (CRGE) and other studies revealed that health sector is one of the top three vulnerable sectors to climate change adverse effects. We also observed its effects on human health in 2015/2016 while we are responding to El-Ñino posed drought in our country, Ethiopia. Thus, FMOH developed this Health National Adaptation Plan by establishing National Technical Working Group from various directorates and agencies of the ministry, relevant ministries and development partners.

FMOH will implement this Health National Adaptation Plan by mainstreaming to its various programmes and by strengthening its partnership with relevant line ministries and development partners. This Health National Adaptation Plan will be implemented with full participation of communities at grass root level through health extension program using health professionals, health extension workers and health development armies.

The implementation of this health national adaptation plan will be supported and monitored by leadership at all levels so that it will be successful in building resilient health sector. So, let's start to health adaptation to climate change according to this Health National Adaptation Plan.

Kebede Worku (MD, MPH)

State Minister of Health

Federal Democratic Republic of Ethiopia

Table of Content

ContentPage

List of Tables

List of Figures

List of Annex

Executive Summary

Climate Change is global issue as its effects are catastrophic and all rounds. It affects agriculture, water sources, transportation and communication, health, life style, etc. Developing countries including Ethiopia are more vulnerable to climate change affects as they have less capacity to adapt climate change.Several parts of Ethiopia like south and east Tigray, East Amhara, East Oromiya, Somali and Afar frequently affected by recurring drought. Similarly, people living aside Lake Tana, Awash River, Baro River,lower part of Omo River hit by over flow flooding. Moreover, several climate diseases were occurred and aggravated in the country. Malaria which is climate sensitive disease is expanding to high lands as high lands temperature gets warm with climate change and being favourable to mosquitoes breeding. Diahrroeaoutbrake especially Acute Watery Diarrhoea become frequent following drought and flood occurrence. Dengue fever cases were reported for the first time in 2014 in Afar, Somali, Harar and Dire Dawa. Similarly, Yellow fever was also reported in South Omo after 60 years Parts.

The development in Ethiopia brings changes in infrastructure accessibility and peoples thinking. The accessibility to improved water source, sanitation facilities, health facilities, schools, etc increased. As a result, the economic and health condition of the country improved. The life expectancy increased as well as the child mortality rate sharply reduced. However, climate change is a great challenge and may ruin all the achievements gained unless great and integrated efforts were made to mitigate and adapt climate change. The Government of Ethiopia launched Climate Resilient Green Economy to avert the threat posed by climate change and to build sustainable economy. This CRGE acknowledges the health sector is one of the three most vulnerable sectors together with water and agriculture sectors. Thus, this Health component of National Adaptation Plan developed.

The overall goal of this health national adaptation plan is to contribute to the main goal of HSTP with focus on to make sure the health system is climate resilient. It has4 strategic objectives. And these are build the capacity of health system for realization of climate resilient health system; enhance the resilience of health system in provision of universal health coverage; enhance early warning and surveillance in the context of health emergency risk management; and create enabling environment for health adaptation to climate change implementation. To implement this HNAP, 6 strategic approaches are drawn.These are mainstreaming climate change adaptation to health programmes, strengthening partnership, strengthening existing health delivery system and community mobilization.

The key intervention areas selected to implement HNAP are strengthening and expanding health infrastructure, strengthening existing Integrated Disease Surveillance and Response, promoting climate resilient sanitation facilities, promoting climate resilient water safety plan, promoting family planning, revising building codes of health facilities, Promoting climate change mitigation initiatives, promoting community health insurance scheme, advocating and creating awareness on climate change and health as well as encouraging operational research on health and climate change.

This HNAP is drawn to be implemented in 2017 to 2020. Since most HNAP activities will be mainstreamed to existing initiatives, projects and programmes, the total budget required is minimal and estimated to be 1, 704, 796,316.00 Birr. However, 809, 623, 200.00 Birr (47.5 %) will be covered by Federal Ministry of Health and respective regional health bureaus; and will be invested to community mobilization.

1 Background

Ethiopia is found in the horn of Africa; and it is the second most populated country in Africa. The country has nine administrative regions and two city administrations. Based on 2007 census, the projected population of Ethiopia is estimated 94.35 million in 2017. Eighty three percent of the population live in rural setting and engaged in small-scale rain-fed agriculture while the rest 17% of the population live in urban areas in a lifestyle which is comparatively less sensitive to climate change. (CSA, 2007)

The geographical set up of the country is full of up and down with the highest altitude at RasDashen which is 4,533 meters above sea level and with lowest altitude at Dalol depression which is 125 meters below sea level. The main rainy season is from June to September for major parts of the country. There is also another rainy season but a light one from February to April for southern part of the country usually found in Oromiya and SNNP. In Ethiopia, high lands receive more rainfall than lowlands and arid areas, and support their life through agricultural livelihoods and with dense population whereas low lands receive minimal rainfall, and people generally support themselves by raising livestock.

The share of electric grid as means of energy source is only 5% and majority (95%) of the households in Ethiopia use biomass fuel as source of energy which contributes to deforestation which in turn lead to land degradation. Though Ethiopia GHGs emission is insignificant comparing to developed countries, the main GHGs emitting sectors in Ethiopia are agriculture and forest which contributes to 87% of the total GHGs emission of the country. Moreover, Energy, Transportation, Industry and buildings contributed equally 3%.However, the main GHG produced in Ethiopia is methaneinstead of CO_2; and this methane is produced from cattle droppings, decaying organic matters including fallen down trees and landfill. Methane is known to exist long time as comparing to CO_2 (CRGE, 2011).

Recurrent drought and flood are common in Ethiopia. Places where frequently hit by floods are East Shoa and Afar aside to Awash River, South Omo near to Omo River, Gambella near to Baro River and Fogera vicinage to Lake Tanna. Similarly, East Amhara, South and East Tigray, Afar, Somali, East Harargie, West Harargie and Borona of Oromiya are places which are frequently hit by drought. Both flood and drought are known to cause malnutrition, social disorder and outbreaks of some diseases such as diarrhea, malaria, Upper Respiratory Tract Infections, meningitis, skin infection, etc.

2. Introduction

The mean global temperature has been increasing due to anthropogenic activities which produced excess Green House Gases (GHGs). The primary gases which are responsible for greenhouse effect are Carbon dioxide (CO_2), Methane(CH_4), Nitrous Oxide (N_2O), Hydro-fluorocarbons (HFCs), Per fluorocarbons (PFCs), Sulphur-hexafluoride (SF_6), Nitrogen Trifluoride (NF_3) and Water Vapour(Fact Sheet, Michigan University, 2011).The ever increasing mean global temperature brings climate change which includes change of ambient temperature, rainfall, wind, etc. Climate change has been observed since the industry revolution due to human activities and the utilization of fossil fuel as a source of energy. But, less attention paid to the climate change as there were several assumptions like nature will balance itself and nothing will happen though greenhouse gases are being increased. Later on, the ever increasing GHGs concentration in the atmosphere resulted in global warming which in turn caused climate change and its consequences. Although the impact of climate change is mediated by ecological, human, social wellbeing and many other factors, the recurring drought and flooding, the emergence of new diseases and re-emergence of already eliminated diseases, and the aggravation of existing vectorborne, water borne and respiratory infections are among the impacts of climate change. WHO study shows that 140,000 excess deaths/year and 5 million disability-adjusted life-years (DALY) since 1970. It also predicted that health impairment annual cost would be $1.5-4 billion by 2030 due to Climate Change. This will incur substantial burden on health services.

Currently, climate change gets high attention globally as its effect challenges both developed and developing countries though the level of vulnerability differs as the capacity to cope with the effects of climate change varies from country to country. The emission of GHGs harms not only the emitters but also non-emitters as there is no boundary for gases movement. Though developed countries emit excessive GHGs as they use comparatively more fossil fuel, its adverseeffectsis much more to developing countries due to their low capacity to cope with. Parties participated at COP_{21} which held in Paris discussed health related issues and acknowledged that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights and the right to health. Furthermore; the adoption of the Paris agreement on its article 109 recognizes the social, economic and environmental value of voluntary mitigation actions and their co-benefits for adaptation, health and sustainable development (UNFCCC, 2015). Moreover, United Nations drew 17 Sustainable Development Goals to be attained till 2030; and arelinked with environmental and social determinants of health (WHO, 2016). Especially end hunger (Goals 2), Ensure healthy life and well-being (Goal3), Ensure availability and sustainability of water and sanitation facilities (Goal 6), Ensure access to affordable, reliable, sustainable and modern energy (Goal 7) and Take urgent action to combat climate change and its impacts (Goal 13)will contribute a lot to healthy life and climate change mitigation and/or adaptation..

Ethiopia has drawnthe Climate Resilient Green Economy strategy (CRGE) in 2011 aiming at having a sustainable and environment friendly economy through improving traits of livestock, undertaking afforestation and re-afforestation, building and using renewable energy, and making industries energy efficient. CRGE and other studies have identified the health sector as one of the most vulnerable sectors to climate change since the disease burden will increase if mitigation of climate change fails. Thus,developing a health adaptation plan is critical to implement convenient adaptation options in the health sector.

The Federal Ministry of Health of Ethiopia(FMOH) has established technical working group which work on developing documents that enable the health sector to adapt climate change's adverse effects. So far, a document of national framework of building climate resilient health sector has already beendeveloped as well as the health vulnerability and adaptation assessment report is produced. Based

on these two documents and World Health Organization (WHO) health adaptation guideline, this National Health Adaptation Plan to Climate Change isdeveloped.

3 Situational Analysis

Ethiopia like other African countries has its urgent need to adapt to climate change stems from its sensitivity and vulnerability to climate change, together with low levels of capacity to adapt. Health vulnerability and adaptation assessment has been conductedby reviewing the available documents for each regional states and city administrations in particular and as a nation in general. A lot of factors have been considered and data were compared to set health vulnerability index for each regional state and city administration. The health vulnerability and adaptation assessment findings revealed that temperature has increased and rainfall has decreased over time in general while access to health service, sanitation and improved water sourcesis improved though great variance amongst regions. As a result, those emerging regions (Somali, Afar,Gambella, and BenshalGumuz,) are relatively more vulnerable to climate change posed health outcomes while these cities (Addis Ababa, Dire Dawa and Harar) are relatively less vulnerable (FMOH/WHO, 2015). The situational analysis made based on the national health vulnerability and adaptation assessment findings, the country profile prepared and issued by WHO and UNFCCC in 2015 and other documents summarized as follows:

3.1 Climate

Climate is a composition of temperature, rainfall, wind, humidity, etc. Climate change is a change of these variables over long period of time usually over 30 years or more. The climate of Ethiopia like other countries' climate is being changing. The primary gases responsible for greenhouse effects are CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3 and Water Vapour. These GHGs retain the heat radiation reflected back from the earth which in return makes the earth warmer. The surface temperature of Ethiopia has increased by 1.3^0C only from 1960 to 2006, and is predicted to increase 1.1 to 3.1^0C by 2060 (The Global Water Initiative, 2010). Depending on the limited Emissions data available for Ethiopia between 1990 and 1994, the agriculture sector was the largest contributor of carbon emissions (WHO and UNFCCC, 2015).Both agriculture and forest sectors attribute 87% of the country GHGs emission (CRGE, 2011).

Since the topography of the country is so ragged, from highlands which aremostly located at central part of the country to lowlands mostly located to eastern and western parts of the country, the mean daily temperature varies from place to place in Ethiopia. The map below shows the daily mean temperature of different parts of the country.

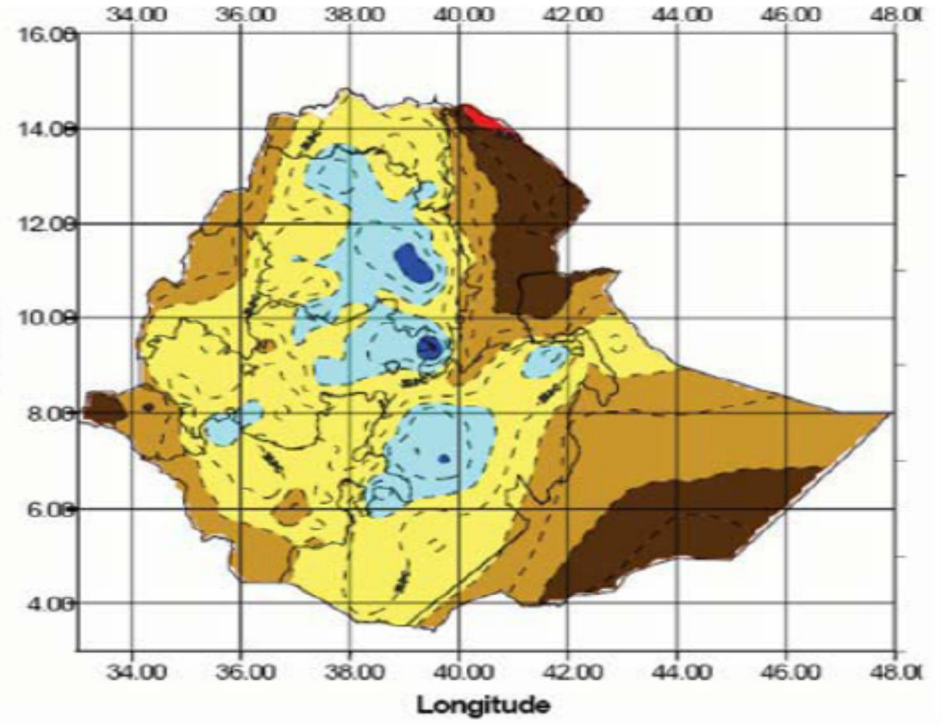


Figure 1: Daily Mean Temperature for the year (^{0}c)

Several projection studies show that temperature will gradually increase all over the country following global warming unless GHGs emission is halted. One study projected the increase in temperature in Ethiopia by 2030, 2050 and 2080, and shownon map as follows if continued as it is and no policy intervention.

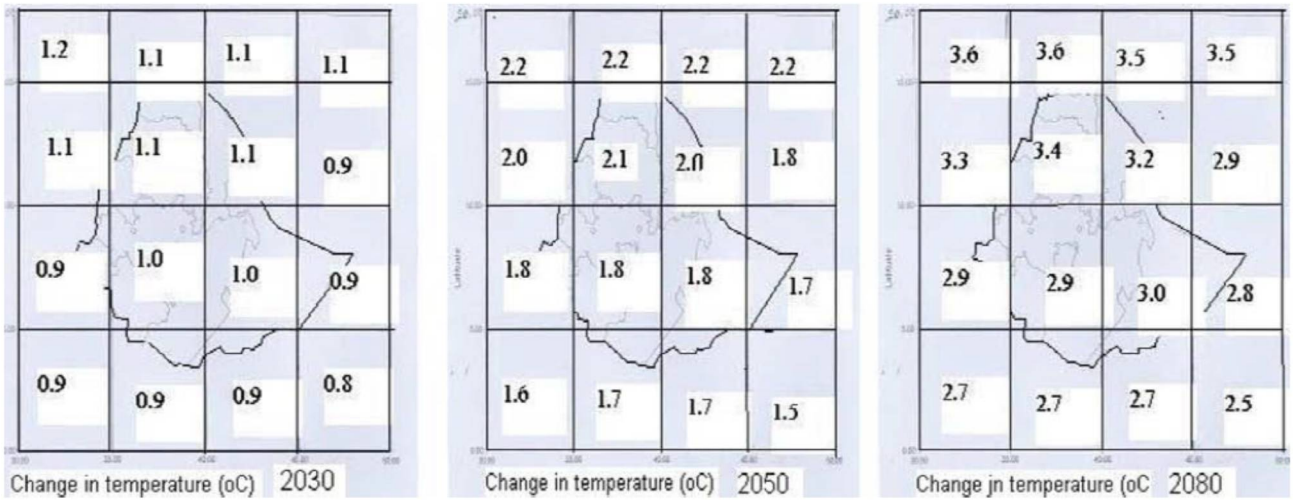
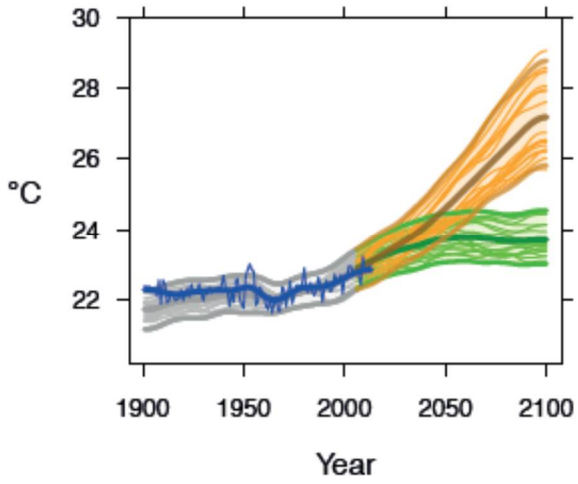


Figure 2: Composite of (Average of 19 GCMs) change in temperature (^{0}c) relative to 1961-1990 normal A1B emission scenarios

A country profile issued by WHO and UNFCCC in 2015 also projected themean annual temperature of Ethiopia to rise by about 4.8°C on average from 1990 to 2100;and the number of days of warm spell ('heat wave') is projected to increase from about 10 days in 1990 to about 250 days on average in 2100 under a high emissions scenario. If emissions decrease rapidly, the temperature rise is limited to about 1.3°C, and the days of warm spell, in 2100, are limited to about 85 on average (WHO and UNFCC, 2015).For detail, see the figures below:



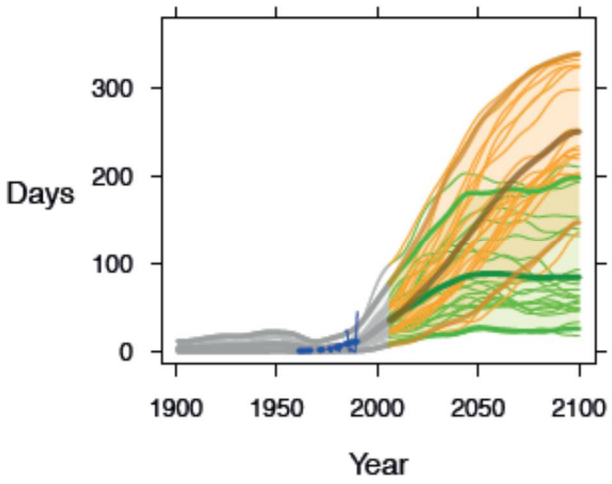


Figure 3: Mean Annual TemperatureFigure 4: Days of Warm Spell ('Heat Waves')

Similarly, the vulnerability and adaptation assessment report done in 2015 revealed that the mean of minimum and maximum temperatures for all regions except Afar has increased and also expected to increase in the future (FMOH/WHO, 2015). Even the minimal increase in temperature and days of warm spell has great effect on productivity, health and wellbeing of human being. This indicated that it will be very difficult to live and work at very low lands of the country in the future which are already hot unless actions are taken to reduce carbon emission and to increase forest coverage globally.

There are two rain seasons in Ethiopia namely ‘kiremt’ and ‘Belg’. ‘Kiremt’ is the main rainy season which lapses from June to September and covers almost all over the country while ‘Belg’ lapses from March to May and covers only some parts of the country mainly parts of Oromiya and SNNP. The mean annual rainfall varied across the country. In general, highlands get more rainfall comparing to lowlands or Kolla. Thus, the highlanders usually engaged in agriculture livelihood while lowlanders engaged in animal rearing. The following map shows the condition of rainfall in different places of the country based on annual mean rainfall.

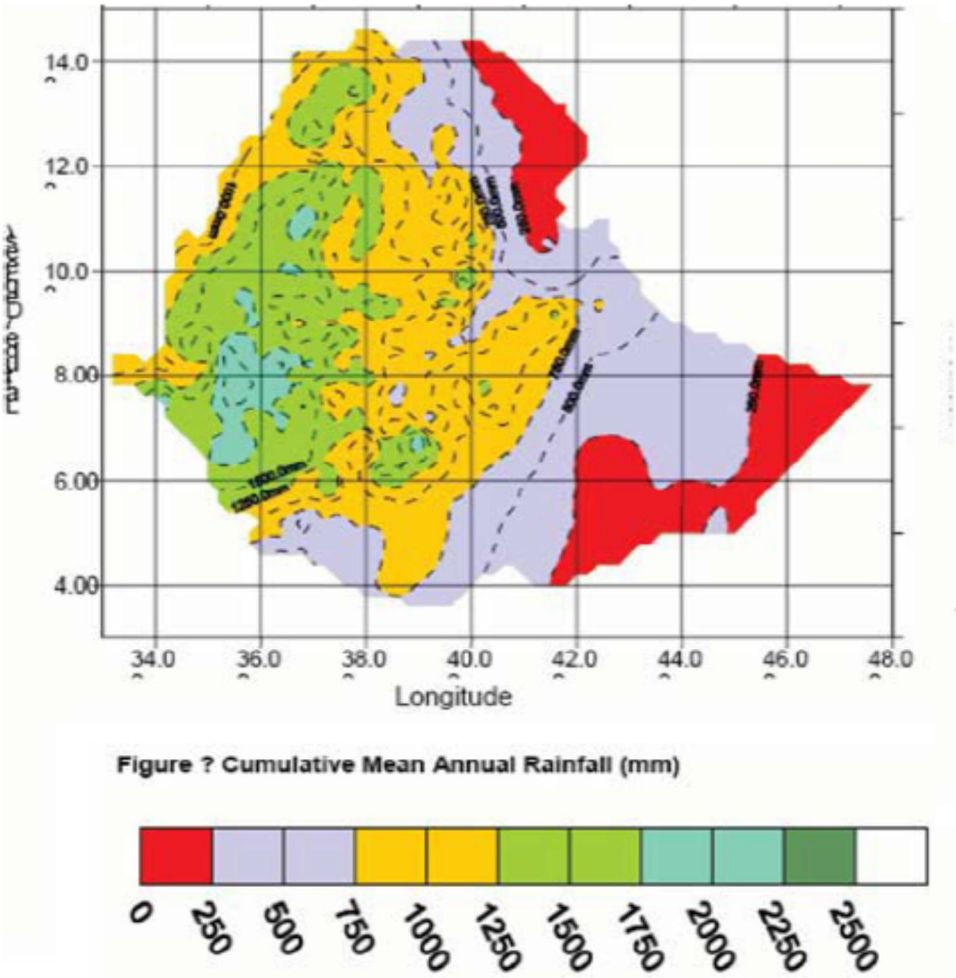
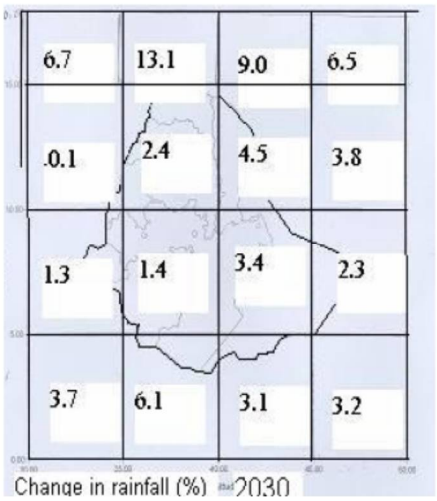
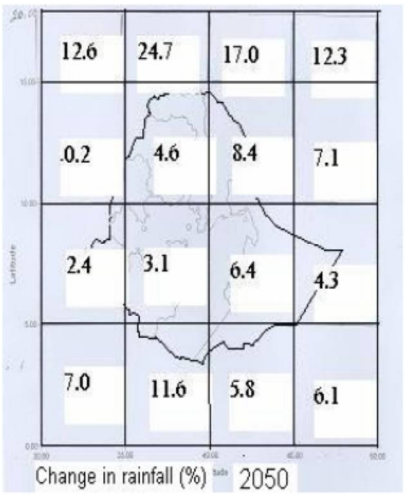


Figure 5: Cumulative Mean Annual Rainfall (mm)

However, the IPCC min range projection indicated that the country mean rainfall will increase in the future irrespective of the country temperature increase due to climate change. This IPCC projectionindicated the increase of rainfall in percentage by 2030, 2050 and 2080, and plotted on the map of Ethiopia as follows:





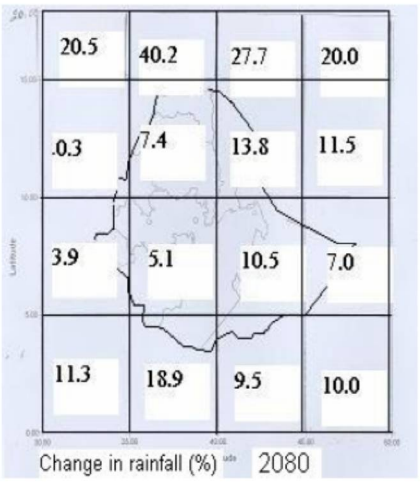
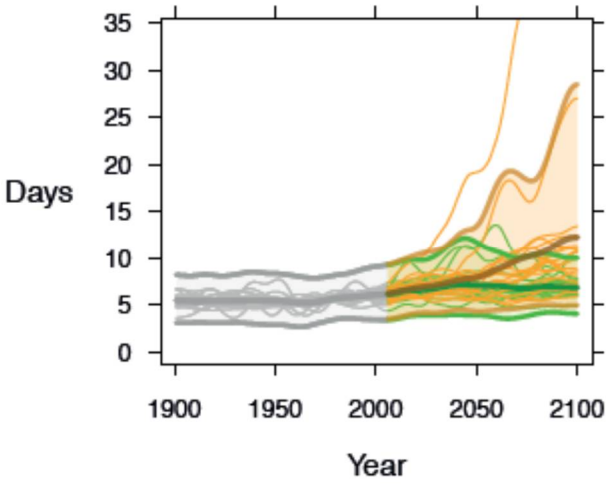


Figure 6: Composite of (Average of 19 GCMs) percentage change (%) in rainfall relative to 1961-1990 normal A1B emission scenarios

Similarly, thereport releasedby WHO and UNFCCC in 2015 also predicted that the country's humidity will increase irrespective of temperature increase in the future. Therefore, the longest dry spell is indicated to decrease slightly from an average of about 95 days to just over 80 days under a high emissions scenario, with continuing large year-to-year variability. If emissions decrease rapidly, the anticipated changes in the length of dry spells are somewhat less(WHO andUNFCC, 2015).



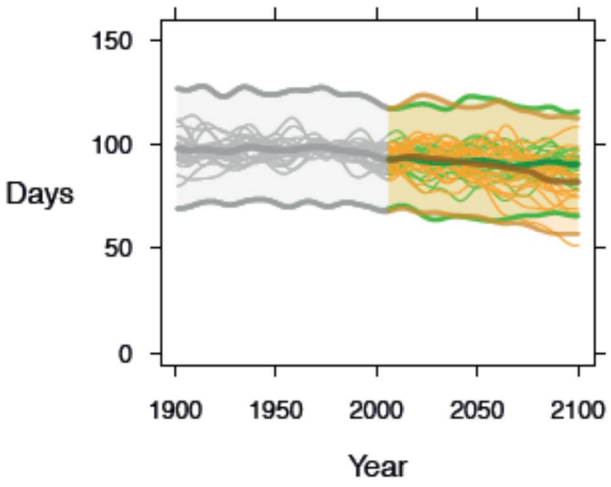


Figure 7: Days with extreme rainfall ('Flood Risk') Figure 8: Consecutive Dry Days ('Drought')

However, the monthly mean rainfall trend analysis done for 1996 to 2014 during the National Vulnerability and Adaptation assessment revealed that the rainfall overall in Ethiopia has gradually reduced through time and would continue to reduce in the future if remedial actions will not be taken. This assessment also indicated that rainfall has been decreased sharply in Gambella, Somali, Tigray, Amhara and Afar regional states, and mildly decreased in SNNP, Oromiya and BenshangulGumuz(/FMOH/WHO, 2015).

3.2 Socio-Economic Situation

3.2.1 Population pressure

Having over 94 million people, Ethiopia is the second most populous country in Africa next to Nigeria. Despite population growth rate declined from 3.1% in 1984 to 2.6% in 2007, the average population density has increased from 34 people per square kilometer to 67.1 people per square kilometer in the same time interval (FMOH/WHO, 2015). Moreover; 83% of Ethiopia's people live in rural areas and engaged in agriculture and deforest thousands hectare of land for agriculture purpose every year. According to 2007 census, Gambella, BenshangulGumuz, SNNP and Oromiya had higher population growth rate than the national average while Addis Ababa had the lowest population growth rate (FMOH/WHO, 2015). Biomass is the dominant, 95%, source of energy in Ethiopia. Population pressure has great role for land degradation and land productivity in addition to being is a major driver of emissions (Climate and Development Knowledge Network, 2014)

3.2.2 Education

A lot of efforts have been made to realize universal access to education in the past two decades by building more schools all over the country with special emphasis to remote places and disadvantaged people. The number of primary schools has increased from 9900 in 1995 to 32,048 in 2014. Similarly, the number of secondary schools increased from 346 in 1996 to2333 in 2014. As a result, the school enrollment in primary education reached 93%. The literacy rate in Ethiopia in general has grown from 25% in 1995/96 to 46.7% in 2010/11. Cities such as Addis Ababa, Dire Dawa and Harari had 86.7%, 63.8% and 59.8% literacy rate respectively which are higher comparing to the other regions. Somali had the lowest literacy rate which was 30.5%(NPC and UN-Ethiopia, 2014). This shows there is great variance in literacy rate among regions as well as between rural and urban settings.

The progress made in education access is remarkable and very important for dissemination of health messages that induce positive health behavior change. However, significant numbers of people in Ethiopia are still illiterate. This illiteracy hinders people from utilizing all existing healthcare services as well as creates difficulties in utilizing the health message transmitted by printed and electronic media. This in turn causes health inequalities.

3.2.3 Economy

The government of Ethiopia has committed to nurture the economic growth of the country and to improve livelihood of its citizen; and visible economic growth has been achieved in the past 10 years. The average per capita income grew from $ 129 in 1999/2000 to $630 in 2013/14. Similarly, the proportion of people living below absolute poverty standard reduced from 48% in 1990 to 23.4% in 2013/14 (NPC and UN-Ethiopia, 2014). However, about 83% of the populations are still engaged in rain fed agriculture which accounts for 40% of the GDP and highly susceptible to climate change. Since majority of the population of the country live densely at highlands and their livelihood is based on agriculture, there is no adequate land to engage all adults in agriculture. As a result, the number of unemployed people is high besides to those known as dependents which include children under 14 and adults over 64 years. Therefore; there is huge dependency ratio in Ethiopia particularly in Oromiya and SNNP where 100 working people support more than 100 dependents (FMOH/WHO, 2015).

Climate change brings considerable risks to economic prospects, as well as to food security (Climate and Development Knowledge Network, 2014). According to World Bank study, countries would loss 5% to 12% of their GDP during catastrophic disease outbreaks (UN and Time for Global Action, 2015). Much of the economic growth is dependent on climate-sensitive sectors such as agriculture, forestry and other natural resources. Thus, the economic growth of the country is usually heavily negatively influenced by drought and flood conditions in the country (Climate and Development Knowledge Network, 2014).

The Government of Ethiopia allocated more budgets for health sector in past two decades as health sector contributes to sustainable development and helps to absorb shocks. The crude health care budget allocated by government gradually increased in the past years but its proportion to the total budget declined from 10.4% in 2010 to 9.1 % in 2012 at national level. Thus, the country failed to meet Abuja declaration target that persuades countries to allocate 15% of the government budget for health care. Similarly, the proportion of health budget allocated in Tigray, Afar, Somali, SNNP, Oromiya and

FMOH has been declined steadily. The health expenditure per capita per year was less than 40 Birr in Somali, SNNP, Amhara, Oromiya and Tigray regional states (HMIS/FMOH, 2011).

3.3 Disasters related to climate change

Climate-related hazards and disasters are among the biggest threats to human health at present (ISCU and ISSC, 2015).Extreme weather events are also leading to breakdown of infrastructure networks and critical services such as electricity, water supply, and health and emergency services (IPCC 5th, WGIII, 2015).Natural disasters like flood, drought, and heat stress are being aggravated by climate change.

The flood disaster occurred in various places of Ethiopia as splash flooding and inland flooding with various intensity and scale in different occasions. Among places were frequently hit by splash flooding are places vicinage to lake Tana, places of Afar and Shoa at lower course of Awash River, places of South Omo along sides of the lower course of Omo river, Gambella aside to Baro River and places along sides of Wabi Shebelle at its lower course. The DRMC registered the flooding disaster occurred all over the country from 1957 to 2007. Here below, a map indicated woredas hit by flood and the frequency of flooding.

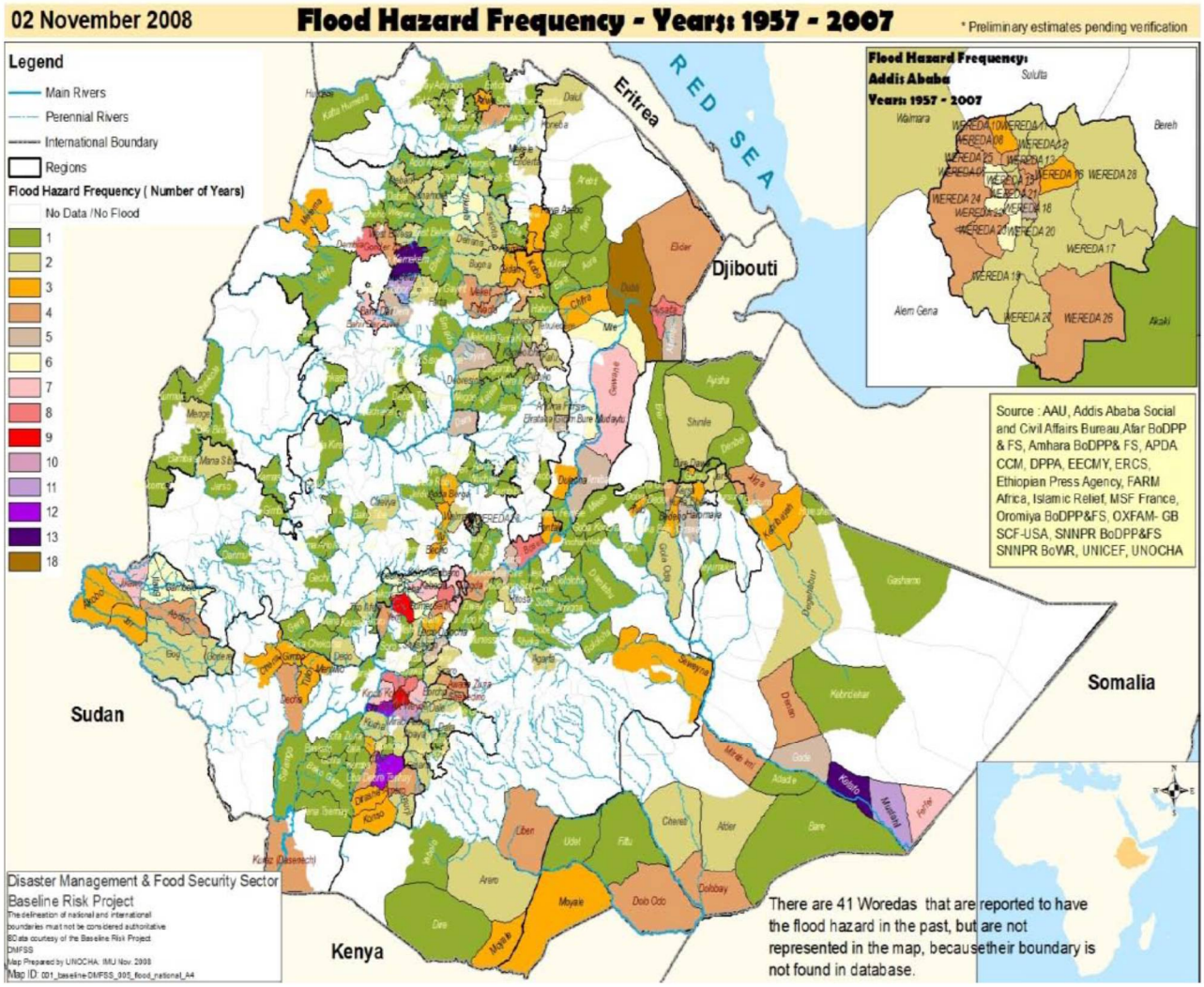


Figure 9: Flood affected woredas1973-2007, DRMC Risk Baseline report 2008

Major floods caused loss of life and property in different parts of the country occurred in 1988, 1993, 1994, 1995, 1996 and 2006.For instance, more than 614 people were died and more than 22, 000 people were displacedin Dire Dawa, 14 villages of South Omo zone and West Shewa zone due to the floods of 2006. Similar situations also occurred in Afar, Western Tigray, GambellaZuria and the low lying areas of Lake Tana in the same period. (NMA, 2007)

Furthermore, the risk of floods would increase in the future as the number of days with very heavy precipitation (20 mm or more) could double (an increase of about 6 days on average) from 1990 to 2100 under a high emissions scenario. It is also projected that by 2030, 248,200 additional people may be at risk of river floods annually due to climate change above the estimated 154,400 annual affected population in 2010 (WHO and UNFCCC, 2015).

Drought has long history in Ethiopia but its occurrence is becoming more frequent as climate is being changing; and human activities interrupts the ecosystem and population pressure depletes natural resources. Drought occurred frequently in different parts of the country following interruption and

shortage of rainfall. Some of the frequently affected places by drought are East Oromiya, East Amhara and East and south Tigray, and major parts of Afar and Somali Regional States. The impacts of past droughts such as that of the 1972/73, 1984 and 2002/03 are still fresh in the memories of many Ethiopians. Since 1980s more than 57 million people have been affected by droughts. Still around 10 million people live in areas at high risk of droughts; and these events are expected to become more frequent due to climate change (Emelie César & Anders Ekbom). DRMC has already registered the drought hazards occurred in Ethiopia from 1973 to 2007 and plotted woredas affected by drought with how frequent are they affected on the following map.

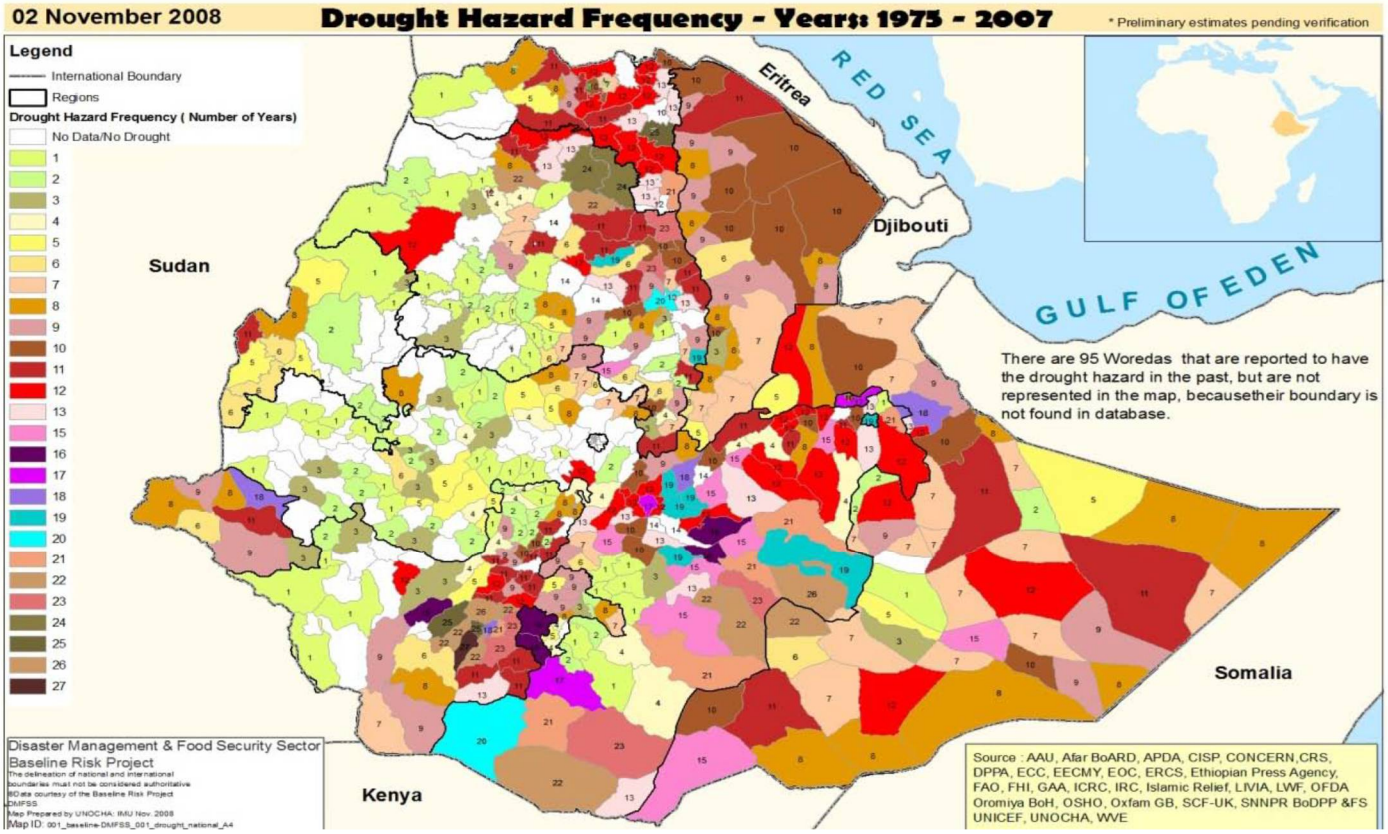


Figure 10: Drought hazard frequency 1975-2007(Source: DRMC Risk Baseline Report, 2008)

The changing climate is has already led to a decline in agricultural production, and cereal production is expected to decline still further by 12% under moderate global warming as temperature and CO_2 rise creates favorable condition for weed growth and pest infestation.(YohannesGebremichael and MebrahtuKifle-NFW and Harvard Medical School)

Mean temperature is increasing across the country following global warming due increase of GHGs concentration in the atmosphere and deforestation of plants that would absorb CO_2. Therefore, the ambient temperature of those Kolla areas of Ethiopia being worst and hampers productivity. It becomes difficult to work at cities in kola areas and outdoor work at rural areas of kola due to excessive heat that would lead to heat stress and heat exhausting. Though there is rarely registered cases related to hot weather in the country, places at east and west low land areas are known to extreme hot weather and intolerable to people who came from highlands. Places like Gode, Dalol, Humera, Gambela, Metema and Guba known for extreme hot weather and town criers in these cites alert people not to asleep during

day time when the temperature reaches intolerable. The temperature of these place will increase more in the future due to climate change and would become very dangerous to work and live in unless our adaptation mechanism become strong or the global warming averted by global mitigation efforts.

3.4 Health Impacts of Climate Change

3.4.1 Malnutrition

Both drought and flood are being exacerbated by climate change and variability which in turn reduce agricultural productivity that usually lead to malnutrition and food insecurity. Malnutrition exposes people to different diseases like tuberculosis, measles and diarrhea. The chronic effect of malnutrition in children is stunting. Stunting of children has usually considered as a status of nutrition in a given community. BenshangulGumuz, Tigray, SNNP and Afar had stunting above national average which was 58% (FMOH/WHO, 2015).The graph below shows the level of stunting by region to compare regions' malnutrition status.

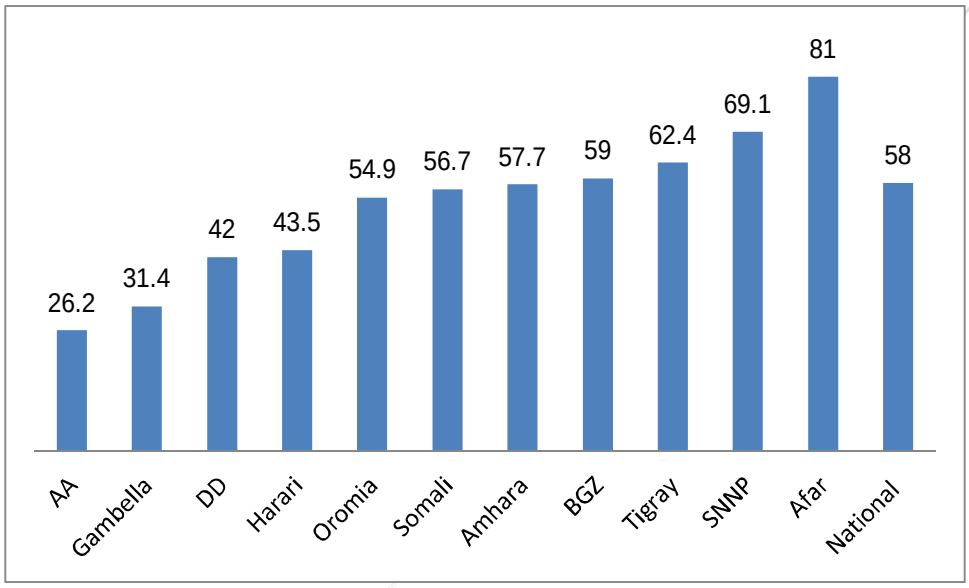


Figure 11: Proportion of stunting among children under the age of five by region, CSA, 2014

3.4.2 Climate sensitive Diseases

The impact of climate change on health is tremendous. It aggravates the existing waterborne, foodborne and vector borne climate sensitive diseases. It also creates favourable conditions for new emerging and/or re-emerging climate sensitive diseases. Local changes in temperature and rainfall have altered the distribution of some water-borne illnesses and disease vectors (IPCC 5th,WG III, 2014).To the Ethiopia context, malaria risk areas are expanding as well as dengue fever emerged for the first time before 3 years and yellow fever re-emerged after 60 years. Moreover, waterborne related diseases of Scabies and AWD occurred as an outbreak following El-Ñino condition in Ethiopia in 2015/16. The major climate sensitive diseases occurring in Ethiopia are elaborated below:

3.4.2.1 Vector Borne Diseases

There are several vector borne diseases that are highly sensitive to climate change in reputation of the vectors as well as parasites which are harbored in the vectors. Malaria is one of the climate sensitive vector borne diseases and the prominent disease in Ethiopia. Four to Five million people infected with and over ten thousand people die of malaria every year (Ayele et al, 2012 and WHO, 2015). According to a special analysis made during the health vulnerability and adaptation assessment in 2015 by FMOH and WHO, the malaria risk area of Ethiopia would increase over 75% as the high land night time temperature increased and expected to push the maximum threshold elevation of malaria transmission (FMOH/WHO, 2015). Therefore, the malaria-prone areas are being wider as global warming changes the environment and creating favorable condition to mosquitoes breeding. As a result, malaria is being spread to highlands like Addis Ababa which were not known for malaria before. Hence, the increasing temperature and interrupted rainfall in Ethiopia creates favorable condition for rapid reproduction of mosquitoes which in turn increases its density and the probability to be bitten by mosquitoes.

Both temperature and humidity affect the survivability and density of mosquitoes' population. Similarly, malarial protozoa incubation period will be shorter as the temperature increases to certain limits. These conditions of increasing mosquitoes density and shorten malarial protozoa incubation period increases malaria transmission rate to some extent.Therefore, there is high risk of malaria epidemic in Ethiopia and may be worsen in the future as exposure to mosquito bite in person-month is projected to increase more than 100% in Ethiopia later in this century which in turn could dramatically increase the burden of those suffering with malaria (WHO, 2008).By 2070, almost 130 million people are projected to be at risk of malaria assuming a high emissions scenario. Population growth can also cause increases in the population at risk in areas where malaria presence is static in the future (WHO and UNFCCC, 2015).

To tackle malaria epidemic, several interventions are being carried out in integrated manner. These include clearing mosquitoes breeding sites; providing mosquito bed nets to households in malarious areas; and treating malaria using effective diagnostic tools and treatment. As per ESPA+ assessment, over 77% of the health posts and 90% of the other health facilities offer malaria treatment service (EPHI, 2014). So far over 65 million bed nets distributed to malaria areas; and 6 million households in malaria areas sprayed with indoor residual insecticides annually (FMOH, 2016). The newly introduced intervention, using bed net as barrier to mosquito bite, has gotten great acceptance by communities living in malaria areas. According to EthiopiaMalaria Indicators Survey (EMIS) of 2011 the percentage of childrenU5 who had slept under a mosquito net the night preceding the survey was 60.2% in 2007, increasing to 64.5% in2011 (FMOH, 2012). But, this figure declined to 45.3% in 2015 survey. The EMIS of 2015 report also revealed that the availability of at least one LLIN was 64% which exceeded to 2011 LLIN availability (54%) but slightly lower comparing to 2005 (69%) (EPHI/FMOH, 201).

Dengue Fever is another highly climate sensitive disease and expanded to all over the world recently due to the vector of this disease, Aedes Egypt, found at altitude as high as 1700 meter above sea level beyond its previous favorable altitude that was below 1000 meter above sea level. Higher ambient temperatures favor rapid development of the vector, increase the frequency of blood meals, and reduce the extrinsic incubation period (EIP). As it was reported by WHO, mosquito-borne dengue is now found in 100 countries worldwide putting more than 2.5 billion people or 40% of the world population at risk

of contracting the disease. The desk review done by Esther and her colleaguesshows that the Comoros, Ethiopia, Kenya, the Seychelles, Somalia, Tanzania, Mauritius and Mozambique were considered endemic for dengue from 1975 to 1996 (Esther et. al, 2010).Consequently; a total of 6,192 dengue fever cases were reported from Gode of Somali region, Hadar of Afar region and Dire- Dawa city administration till May, 2014 which was never and ever reported before (WHO –Ethiopia, 2014).

Yellow Fever is also climate sensitive disease and transmitted by a mosquito of the same species responsible for Dengue Fever. WHO has classified it as one of the immediately reportable disease; and passengers from countries known for yellow fever ought to take Yellow Fever vaccine while they travel from country to country aiming to control the disease. However, Yellow Fever reoccurred as an outbreak in South Omo in 2013 after 60 years and 159 cases were reported till January, 2014.

3.4.2.2 Waterborne Diseases

Though accessibility to improved water sources is growing in all regions of Ethiopia and reached 57% at national level, still significant numbers of people use water from unprotected sources. Furthermore, the water availability and sustainability of water sources is being affected by climate change due to high evaporation and less percolation to ground (ISCU and ISSC, 2015). Water is also contaminated during the fetching process, transportation and utilization in Ethiopia in addition to significant number of the available improved water sources were contaminated by flooding due to poor construction design. A national water quality survey conducted in 2010 generated strong evidence that one-third of the improved wells and springs used for domestic purposes were found contaminated with faecal matter (WHO and UNICEF, 2010). The magnitude and rate of contamination of these springs and wells would be higher if the survey were undertaken in rainy season or after wards.

In Ethiopia, there are several water borne diseases which are highly influenced by climate variability and change in Ethiopia. Diarrhoea is one of the water borne diseases which is highly affected by climate variability and change. Diarrhea outbreaks are usually occurred during rainy season since unprotected water source overwhelmed by flooding or water pipes cross contaminated by runoff water. The flood events in Gambella and Dire Dawaof 2006 were accompanied with diarrhea outbreak. The health vulnerability and adaptation assessment done in 2015 by FMOH/WHO indicated that the association between diarrhea and rainfall increased as the rainfall increase in Amhara, Oromiya, Somali, Addis Ababa and SNNP. Therefore, the emergence of acute watery diarrhea during rainy season in Ethiopia could be partly explained by damage to the integrity of water sources and being contaminated by runoff water which carry human faeces and other contaminants. Having poorly constructed WaSH facilities, diarrhea is common and predominant particularly during rainy or wet seasons. Thus, diarrhea was reported after floods increased in emerging regions namely Somali, Gambella and BenshangulGumuz in 2011 (FMOH/WHO, 2015).

The rising temperature exacerbates the existing water scarcity in Ethiopia by increasing evaporation and early drying rivers and other water bodies. The 2015/16 El-Ñino posed drought occurred in major parts of Ethiopia was expressed by water scarcity for human being and animals. As a result, people in the drought affected areas were suffered by scabies and/or Acute watery diarhoea (AWD) which were related to poor personal hygiene and using unsafe water for domestic use. People could not get adequate water to wash their body regularly due to drought there; and forced to use unsafe water for domestic use including for drinking.

As temperature rises the prevalence of diarrhoea would increase to a certain limit. Though the total proportion of diarrhoea is expected to decline gradually in Ethiopia due to the efforts being made in improving WaSH facilities, the diarrhea proportion attributed to climate change would increase gradually. The country profile for Ethiopia which was released by WHO and UNFCCC in 2015 revealed that diarrhoeal deaths attributable to climate change in children under 15 years old is projected to be about 9.6% of the over 42,000 diarrhoeal deaths projected by 2050 under a high emissions scenario. Although diarrhoeal 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 and UNFCCC, 2015)

3.4.3 Respiratory Tract Infections

According to FMoWIE assessment, nearly 89% of the country households use biomass fuels such as fire wood, dung, charcoal and agriculture residue as source of energy for cooking, lighting and heating. These biomass fuels are relatively unclean fuel and produce tremendous fine and respirable particulate matters and toxic gases during combustion. These particulate matter and toxic gasses cause indoor air pollution and are highly associated with respiratory impairment like bronchitis, influenza, pneumonia, asthma, lung cancer and chronic obstructive pulmonary diseases (WHO, 2014). Thus, child pneumonia and other respiratory diseases are on the top ten of diseases of morbidity in Ethiopia.

The ambient air pollution is also becoming a serious problem in cities and big towns of Ethiopia due ever increasing air pollution from unclean fuel combustion by transport vehicles, industries and manufacturing enterprises, waste disposal sites and households. Indoor air pollution contributes up to 12% to ambient air pollution (WHO, 2014). In Ethiopia, it is projected that a reduction in Short-Lived Climate Pollutants (SLCPs) could prevent 24,800 premature deaths per year from outdoor air pollution (PM2.5 and ozone), from 2030 onwards. Moreover, 63% percent of an estimated 36,800 child deaths due to acute lower respiratory infections in Ethiopia is attributable to household air pollution (WHO and UNFCCC, 2015).

3.4.4 Heat stress

Thereare well recognized discomfort caused by heat stress in dry season in East and South-West Ethiopia. Thus, local administrators and town criers warn dwellers not to sleep day time, and to take other cautions. There have been deaths due to heat stroke in these areas though they were not well documented. Due to global warming, lowlands such as Gambella, Guba, Humera, Dalol and Gode are being over heated. There is likelihood of disease and death due to more intense heat waves on the above mentioned place and in cities located in hot areas (IPCC 5th WRGIII, 2014). Children and elders are the most affected during heat stress and heat waves. The heat-related deaths in the elderly (65+ years) in Ethiopia is projected to increase to over 65 deaths per 100,000 by 2080 compared to the estimated baseline of under 3 deaths per 100,000 annually between 1961 and 1990 under a high emissions scenario. A rapid reduction in emissions could limit heat-related deaths in the elderly to just under 12 deaths per 100,000 towards 2080 (WHO and UNFCCC, 2015).

3.5 Physical Infrastructures

3.5.1 Sanitation Facilities

Latrinesarethe most important sanitation facilities which prevent faeco-oral transmission of communicable diseases being a barrier on the transmission route. Demographic and Health Survey (DHS) of 2016 reported that 61% of the rural communities and 93% of the urban communities had access to any form of latrine which shows improvement in coverage in rural areas since DHS 2011 when 55% of all households in rural areas had a toilet facility (CSA, 2016). However, the access to improved latrine is still low which is 28% (WHO and UNICEF, 2015) and far below millennium development goal as the target was to reduce the sanitation inaccessibility by half in 2015. The unimproved latrines are vulnerable to flooding since they have poor superstructure and less mounted wall that may not protect the latrine from filling by rain water and runoff water respectively. Thus, majority of the existing latrines are not climate resilient and used to collapse by runoff water during rainy season.

Furthermore, people practicing open defecation declined from 68% in 2005 to 32% in 2011(WHO and UNICEF, 2015). This shows that a remarkable change in open defecation practice has achieved but it is still being practiced by significant number of people despite all efforts being made to make communities open defecation free through Community Led Total Sanitation and Hygiene (CLTSH) and other approaches.

3.5.2 Health Facilities

As building up the health sector creates resilience to shocks (ICSU and ISSC, 2015), improving the health service delivery is important to bring sustainable development. Thus, the Government of Ethiopia (GoE)has exerted tremendous efforts toimprove the health coverage of the country in last 20 years. As a result, access to basic health care reached 83% by constructing health posts for each rural kebelle, by constructing new health centers and upgrading previous health posts and clinics to health centers,and booming of private health facilities. Similarly, GoE is building new additional hospitals to increase access to hospital health service. Thus, approximately one hospital is serving toabout 300, 000 population which is great improvement comparing to one hospital was serving to 490, 000 population in 2008 though hospital service access is still need further improvement(FMOH/WHO, 2015).Here below the distribution of public health facilities by region.

Table 1: Distribution of public health facilities, by region, ESPA+, 2014

Facility type	Region	Total

	Tigray	Afar	Amhara	Oromia	Somali	Ben. Gumuz	SNNP	Gambella	Harari	Addis Ababa	Dire Dawa	
Referral Hospital	1	1	5	7	1	0	5	1	1	13	1	36
General Hospital	14	3	4	31	8	2	10	0	1	0	0	73
Primary Hospital	16	2	64	63	1	4	13	2	0	0	1	166
Health Center	213	78	849	1,317	165	40	731	32	8	97	15	3,545
Total	244	84	922	1,418	175	46	759	35	10	110	17	3,820

Nevertheless, Health facilities ought to have continuous water and power supplies, sanitation facilities, transportation access, electric supply and means of communication to operate properly, and to provide health care to the standards. According to Ethiopia Service Provision Assessment plus Census (ESPA+) of 2014, majority, 95.3%, of all facilities of Ethiopia have functional latrines for clients as well as for the staff.Similarly, this assessment report indicated that two-third of all health facilities had access to improved water sources; and majority of the health facilities had access to road and telephone. However, there was variance among regions in accessing the above services. Here below a Table that shows health facilities' access to electricity and improved water source by region.

Table 2: Public health facilities accessed electricity and improved water sources by region, ESPA+,2014

Region	Access to regular electricity in %		Access to improved water sources in %	
	Health posts	Health Centers and Hospitals	Health posts	Health Centers and Hospitals
Tigray	44	64	40	86
Afar	50	70	55	45
Amhara	54	45	63	79
Oromia	18	49	39	74
Somali	15	78	40	48
BenishangulGumuz	10	47	52	76
SNNP	24	50	39	72
Gambella	15	68	67	77
Harari	24	63	52	94
Addis Ababa		60		97
Dire Dawa	42	82	65	96

Regarding waste management, the assessment revealed that 55% of the visited health facilities had incinerator to burn wastes; 83% of the visited health facilities had placenta pit to dispose in placenta and surgically removed bodies; and 61% of the visited health facilities had one means of liquid waste disposal (Septic tank, soak away pit, percolation ditch or collection tank) (EPHI, 2014). Details of the sanitation facilities availability in the visited health facilities are shown on the Table below:

Table 3: waste management condition in Sample visited health facilities, ESPA+, 2014

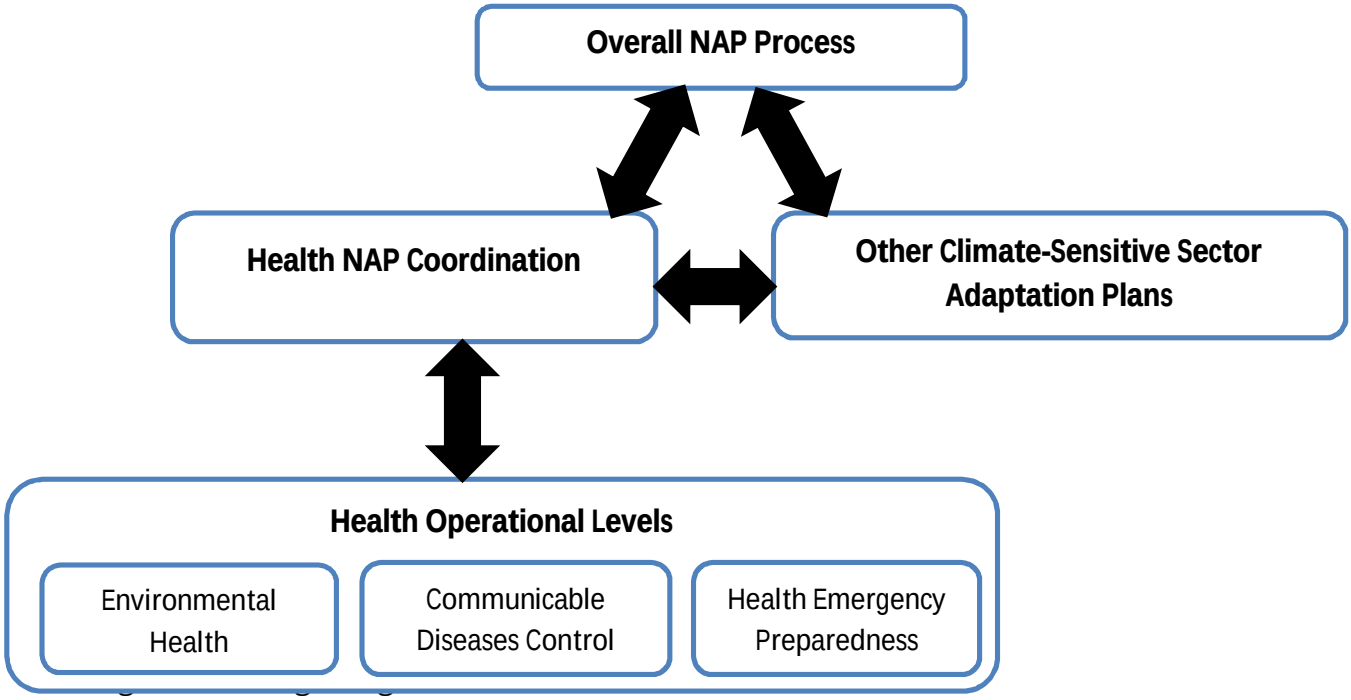
Background characteristics	Percentage of facilities having:						Total number of facilities visited
	Incinerator	Placenta pit	Septic tank, soak away pit, percolation ditch or collection tank	Sewage line	Written guidelines for health care waste management	Trained staff	
Facility type							
Referral Hospital	61	77	77	81	65	23	31
General Hospital	69	94	86	79	65	35	71
Primary Hospital	76	100	80	80	47	31	44
Health Center	55	83	60	60	14	8	3,314
Region							
Tigray	70	96	74	76	56	19	240
Afar	34	80	42	50	13	13	64
Amhara	48	78	47	49	14	10	824
Oromia	57	84	72	71	8	5	1,294
Somali	68	80	40	26	5	7	149
BenishangulGumuz	62	85	41	56	35	21	34
SNNP	54	83	56	59	17	6	713
Gambella	37	60	47	40	3	7	30
Harari	60	80	80	70	60	50	10
Addis Ababa	52	93	81	85	31	36	85
Dire Dawa	82	100	88	76	65	53	17
Urban/rural							
Urban	62	91	70	68	29	19	1,177
Rural	52	79	56	58	9	4	2,283
Total	55	83	61	61	16	9	3,460

Therefore, this indicates that even though great improvement in fulfilling sanitation facilities for public health facilities significant numbers of public facilities are still without basic sanitation facilities to manage their wastes properly.

3.6 Institutional Setup

FMOH has restructured itself following the business process re-engineering (BPR) study carried out in the ministry. Accordingly, directorates, general directorates and Agencies established to perform the mission of FMOH. In this BPR, Public Health Emergency Management (PHEM) Directorate was established under Ethiopian Public Health Institute (EPHI) in 2009 to prevent and minimize adverse effects of disasters and disease outbreaks including climate change posed ones. Similarly, the health sector structure reached to the community by establishing health posts for each rural kebelle and deploying HEWs there to provide basic health services. Having a structure that reach to grass root level and the prompt supports of the ministryto

regional states are helpful to implement the health adaptation plan to climate change. Here below the organogram that shows how to integrate H-NAP to the overall NAP process.



Source: WHO guidance to protect human health through Health Adaptation Planning

3.7 Human Resource Development

There has been massive training of health professionals in universitiesand health sciences colleges to fulfill the gap of trained health workers in most health facilities in the last decade as there hasbeen massive expansion of health services by building new ones and by upgrading some of the existing health facilities. In the past 10 years, numerous new health workers deployed to grass root level to satisfy the health needs of communities. A total of 107, 947 health workers of all categories of health professionals including Health Extension Workers (HEWs) were in service in 2013.Among these, the proportions of critical health workers needed during disasters and disease outbreaks are stated on Table 4 below:

Table 4: proportion of critical health professionals to population by Region, 2013

Region	Population	Physician		Nurses		HEW

			Health Officers		Env'tal Health	
Addis Ababa	3,122,000	1:6,062	1:5,152	1:784	1:22,788	1:2,476*
Afar	1,634,000	1:62,846	1:23,681	1:2,389	1:74,273	1:2,117
Amhara	19,626,000	1:44,911	1:20,380	1:2,635	1:785,040	1:2,583
Ben-Gum	947,000	1:41,174	1:9,763	1:1,126	1:315,667	1:946
Dire Dawa	415,000	1: 8,646	1:6,484	1:850	1:103,750	1:5,321
Gambella	383,000	1:27,357	1:7,816	1:768	1:15,320	1:1,757
Harari	220,000	1:3,188	1:3,793	1:395	1:220,000	1:5,641
Oromia	31,948,000	1:56,645	1:19,398	1:2,303	1:29.886	1:2,262
SNNP	17,403,000	1:57,059	1:12,958	1:1,784	1:29,800	1:2,054
Somali	5,165,000	1:67,961	1:32,898	1:3,054		1:5,688
Tigray	4,866,000	1:25,611	1:11,084	1:1,067	1:18,573	1:2,965
National**	85,729,000	1:32,132	1:15252	1:1,884		1:2,460

*2012 data; **Includes Health Professionals in the Federal institutions;
Source: Health and health related indicator

3.8 Enabling Policies, Strategies and Programmes

There are many enabling factors including policies and strategiesthat aid in adaption to climate change in the health sector. Among these, the Constitution, theHealth Policy, the Climate Resilient Green Economy Strategy, Health Extension Programme, and National Sanitation and Hygiene Strategic Action Plan are vital. The Constitution under its articles of 40, 90 and 92 stated that all citizens shall have a right to live in a clean and healthy environment. The constitution also clearly noted as well that development programmes and projects shall not damage or destroy environment.

Similarly, the health policy under its "general strategies" promotes "inter-sectorial collaboration" including accelerating the provision of safe and adequate water for urban and rural populations, developing safe disposal of human, household and agricultural wastes as well as encouragement of recycling, and developing measures to improve the quality of housing and work enterprises for health(Transitional Government of Ethiopia, 1993). The national sanitation and hygiene strategic action plan was also adopted by FMOH in 2011 with the purpose to improve the health and living conditions of the people of the country by ensuring accessibility to improved sanitation and hygiene facilities as well as management of drinking water at household level.

To prevent and control of Acute Watery Diarrhoea (AWD), a strategy drawn in 2014 with the view of AWD affects economy and tourism industry severely. This strategy also emphasizes that comprehensive promotional and preventive approaches are important to protect communities from consequences of AWD. Moreover, this strategy indicated that the importance of implementing a multi-sector approach to sustain the prevention and control of AWD since AWD and other climate sensitive diseases have multiple root causes (FDRE, 2014).

The Ethiopian health flagship, HEP, was designed to serve as a bridge to convey primary health services at community level. The HEP has 16 packages and majority of them deal with disease prevention and health promotion interventions. The HEP has obtained remarkable achievements such as increased institutional delivery, increased family planning utilization, increased latrine coverage, decreased malaria incidence, decreased HIV incidence, etc. Therefore, communities will be aware of climate change effects on human health as well as communities' role in adapting climate change through HEP using HEWs and HDAs.

There are also proclamations and strategies issued by House of Peoples Representatives (HoPR) and relevant ministries respectively. These providea ground to implement national health adaptation plan to climate change. Accordingly, the then Federal Environmental Protection Authority (FEPA) issued Environmental Impact Assessment proclamation in 2010which enforces investments to undertake an Environmental Impact Assessment (EIA)that enhance the identification of hazards that can be mitigated during the project development. FEPA also issued Environmental Pollution Control Proclamation in 2010which enablesFEPA to control environmental pollution using legal enforcement and institutional arrangements (FMOH/WHO, 2015).

Ethiopia has also launched the CRGE initiative in 2011 considering the country's economic achievements will be ruined and could not be sustained due to climate change unless interventions made. This CRGE acknowledges the impacts of climate change to health sector and identified the health sector as one of the most 3 vulnerable sector to climate change together with agriculture and water sectors(FMOH/WHO, 2015). And this is the basis for FMOH to initiatethis H-NAP which will be a component of the National Adaptation Plan, and will focus mainly on environmental health, communicable disease control and health emergency preparedness. Therefore, available strategies and actions can increase resilience across a range of possible future climates while helping to improve human health, livelihoods, social and economic well-being, and environmental quality (IPPC 5th, WG III, 2014).

3.9 Climate Change'sImpact to the Health Sector and Vice Versa

The changing climate is heavily impacting the health sector. Several studies showed that climate change is aggravating several communicable and non-communicable diseases such as malaria, dengue fever, yellow fever, diarrhea, meningitis, asthma, heat stroke, heart diseases, lung cancer, etc. Malaria is expanding from low lands to high lands of Ethiopia which were not known for malaria like Addis Ababa. Diarrhea prevailedas an outbreak in Ethiopia following drought and flood events occurred frequently in the past year. Scabies also occurred in large parts of Ethiopia in 2015/16 following El-Ñino posed drought due to scarcity of water to keep personal hygiene.

Though it is not significant, flooding events occurred in significant places of Ethiopia in the past years impaired the health service delivery due to destruction of roads, electric and water infrastructure. However, predictions showed that the rainy days and rain intensity for Ethiopia will increase in the future. If the rain intensity increases, definitely there will be more flooding events that can destruct infrastructures including health infrastructures unless otherwise preventive measures taken ahead. The burden to the health services would also increase as climate change aggravates natural disasters that would cause social instability, physical damage, morbidity and mortality.Until mid-century, projected climate change will impact human health mainly by exacerbating health problems that already exist. Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions

and especially in developing countries with low income, as compared to a baseline without climate change (IPCC 5th, WGIII, 2015).

On other hand, health facilities use comparatively more energy and water to operate appropriately. Energy is required in health facilities for heating and cooling in medical care units, for sterilization of medical utensils and equipment, to run medical instruments and machines, to preserve medicines, reagents and vaccine in refrigerators, for cooking food, etc. However, significant proportions of the health facilities in Ethiopia are inaccessible to national electric grid. Consequently, these health facilities use liquid carbon fuels to run electric generators, and solid carbon fuel for cooking and boiling in their daily operations. Moreover, some of the wastes collected in health facilities burned in incinerators which emit GHGs mainly CO_2, and trace amounts of N_2O, NH_4 and S_6O (Health Care without Harm and Practice Green Health). Therefore, the health sector is contributing to Ethiopia's GHG emission though it is insignificant comparing to major GHGs contributing sectors, agriculture and forest.

3.10 Vulnerable to Health impacts of Climate Change

Vulnerability is a function of exposure, sensitivity and adaptive capacity. There is risk of food insecurity and the breakdown of food systems linked to warming, drought, flooding, and precipitation variability and extremes particularly to poorer populations in urban and rural settings (IPCC 5th, WGIII, 2014). Because, poor people have little resource that required for food, medical expense, transportation, energy, etc during disaster. One study showed that children from the poorest 20 per cent of households are more than twice as likely to be stunted as those from the wealthiest 20 per cent. Similarly, under-five mortality rates are almost twice as high for children in the poorest households as for children in the richest(UN and Time for Global Action,2015).

Rural population are more vulnerable to urban population as they were less accessible to quality health service and improved sanitation facilities (UN and Time for Global Action, 2015) There is a risk of loss of rural livelihoods and income due to insufficient access to drinking and irrigation water and reduced agricultural productivity, particularly for farmers and pastoralists with minimal capital in semi-arid regions(IPCC 5th, WGIII, 2014).Pastoralist communities are most vulnerable to climate change posed drought as they need water badly not only for domestic purpose but also for their livestock. Since majority of Ethiopia's population live in rural areas and relied on subsistent agriculture which is fully depend on rain fall, they are more vulnerable to drought than urban dwellers. The Disaster Risk Management Commission (DRMC) report showed that most of the Productive Safety Net Programme (PSNP) and emergency recipients were residents of Somali and Afar regional states respectively while PSNP recipients in Addis Ababa wererelatively small in number (FMOH/WHO, 2015).

Women and children are usually the most affected by malnutrition as they have more responsibility to take care of the family and less capability to get food by themselves respectively. Women often experience additional duties as labourers and caregivers as a result of extreme weather events and climate change, as well as from society's responses to climate change (e.g. male migration). Thus, they face more psychological and emotional distress, reduced food intake and adverse mental health outcomes due to displacement, and in some cases, increasing incidences of domestic violence(Climate and Development Knowledge Network, 2015). Moreover, women put their health at risk while they use of traditional biomass methods for cooking (ICSU and ISSC, 2015).Air pollution from traditional

biomass usage is a prime cause of premature deaths to children and chronic disease to women (ICSU and ISSC, 2015).

Children and the elderly are often at higher risk due to narrow mobility, susceptibility to infectious diseases, reduced caloric intake and social isolation. Young children are more likely to die from or be severely compromised by diarrheal diseases and floods. Similarly, the elderly face disproportional physical harm and death from heat stress, droughts and wildfires(Climate and Development Knowledge Network, 2015).

4 Goal

- This health national adaptation plan contributes to main goal of HSTP with the focus on to make sure the health system is climate resilient.

5 Strategic Objectives

- Enhance the early warning and surveillance in the context of health emergency risk management
- Building the capacity of health system for realization of climate resilient health system
- Enhance the resilience of health system in provision universal health coverage
- Create enabling environment for health adaption to climate change implementation

6 Strategic Approaches

6.1 Mainstreaming climate change adaptation to Health Programmes

Climate change creates a condition that aggravates or alters climate sensitive diseases' nature.Strengthening the existing interventions is more effective than creating a new structure or function to tackle climate change driven health consequences. Therefore, mainstreaming climate change adaptation to relevant activities and duties of the health sector is crucial. For instance, adopting building codes of health facilities by health sector to resist climate change effects, maximizing climate information utilization by the health sector for predicting and preventing climate sensitive diseases epidemics as well as to prepare the needed logistics ahead of disaster or disease outbreak, building and renovating WaSH facilities that resilient to climate change, etc. Therefore, FMOH will assign an expert to coordinate, organize, and monitor adaptive activities carried out by respective directorates and agencies of FMOH.The Table below indicates activities to be mainstreamed by FMOH and its structures down to grass root level.

Table 5: Activities to be mainstreamed

S.N	Activity
1	Developing and adopting climate proof latrine design and technology guidelines • Providing training on improved and climate proofed latrine design and technology options • Conduct advocacy and awareness on the need of weather variability and climate proof latrine design and technology to decision makers of WASH sector including development partners Mainstream to existing ONE WASH Programme weather variability and climate proof latrine design and technology
2	Preparing required logistics for averting climate change posed disasters
3	Strengthening Early Warning and Integrated Diseases Surveillance • Link disease surveillance with weather and climate information for climate sensitive diseases • Establish 2-4 pilot Sentinel sites for climate sensitive diseases • Providing training on integrated health and environment surveillance to health workforces Conduct Operational research to generate evidence on climate change and health in Ethiopian Context
4	Providing training on utilization of climate data to prevent and control of climate sensitive diseases
5	Promoting , Monitoring and Surveillance of Drinking Water Quality for realization of Safe Drinking Water • Establish water quality Monitoring and surveillance • Training of FMHACA inspectors on Drinking Water Quality Monitoring and Surveillance. Providing training on household water treatment and safe storage for health and water sector work forces
6	Sensitizing people on the health impacts of climate change and adaptation options
7	Advocating and promoting walking and using bicycle as means of transportation to mitigate climate change
8	Issuing health facilities' building codes that include mechanical cooling devices, planting suitable vegetation, and self-supplying of water and energy.
9	Conducting active surveillance with special emphasis to drought and/or flood prone areas
10	Promoting family planning in all over the country

6.2 Community Mobilization

To aware the community at large, mobilizing people about climate change and its impact on health as well as options to adapt climate change will be carried out regularly. Indigenous, local, and traditional knowledge systems and practices will be promoted as major resource for adapting to climate change. The social mobilization will be carried out principally by HDAs and HEWs through face to face communication. This social mobilization will be supplemented with distributing printed materials as well as through spots, documentaries and group discussion using existing mass media targeting specific

locality and/or nationwide. Moreover; planned advocacy workshop will be conducted on climate change's health impacts and adapting it to influence politicians, policy makers and natural leaders.

6.3 Strengthening partnership

Cooperation and collaboration among sectors is important since climate change effects are wide and borderless, and affects most sectors directly or indirectly. Therefore, FMOH will establish partnership with the beneficiary communities as well as line ministries and other partners which have great contribution to overcome the adverse effects of climate change on health sector. These line ministries include Ministry of Environment,Forest and Climate Change; Ministry of Agriculture and Natural Resources; Ministry of Water, Irrigation and Electricity; Ministry of Urban Development and Housing;Office of Government Communication Affairs ; National Metrology Agency;Ministry of Education;etc. The following Table details the partnership that FMOH intended to create with relevant ministries and development partners.

Table 6:Partners and Tasks to be implemented together with partners

S. N	Intervention/Initiative	Partner	Tasks to be implemented with partners
1	Awareness creation on climate change posed health effects and adaptation options	Communities/ Development Partners/OGCA /MoE	-identifying climate change posed health effects and adaptation options -Sensitizing people on climate change posed health and adaptation options --Preparing documentaries and spot messages and communicating appropriately
2	Capacity building on vulnerability and adaptation assessment	Universities	-Providing training on vulnerability and adaptation assessment for regional technical working group members
3	Strengtheninghealth surveillance system	DRMC/ MoANR	-Organizing nutritional survey -Improving Nutritional Surveillance
4	Promoting climate resilient water safety plan	MoWIE	-Establishing CRWSP Teams -Conducting Joint Supervision -Strengthening Water Quality control -Promoting self-supplied water for health facilities
5	Revising building codes of health facilities	MoUDH	-Revising health facilities' building codes
6	Promoting climate change mitigation initiatives	MoWIE/MoAN R/MoT/MoYS/ Development Partners/Private companies	-Promoting gardening and planting trees with wide trunks -Introducing solar/wind energy for health institutions -Promoting bicycle riding as means of transportation -Promoting energy saving stoves

7	Encouraging operational research on health and climate change	MoEFCC/MoST/Universities	-conducting local operational research on climate change and health
8	Providing training on integrated health and environment surveillance to health workforces	MoEFCC	-conducting training on integrated health and environment surveillance
9	Providing training on utilization of climate data to prevent and control of climate sensitive diseases to health and metrology workforce	NMA	-Conducting training on how to use climate data to prevent and control climate sensitive diseases
10	Capacity building of health sector to be resilient to climate change	Development Partners	-Supporting health facilities to have self-water supply, renewable energy and green environment

6.4 Strengthening the existing health system

The health system composed of the structure or process of health care service delivering, the human resource and the medical resources used during provision health care service. Since health system is broad and requires to polishing continuously, this adaptation plan will focus in strengthening key areas that have great role in building climate resilient health system.

The existing Integrated Disease Surveillance and Response (IDSR) captures14 immediately reportable and 7 weekly reportable diseases. Some of these diseases are climate sensitive diseases or health outcomes which include yellow fever, malaria, dysentery, meningitis, malnutrition and measles. The existing IDSR merely rely on disease pattern irrespective of weather variability, climate change or environmental change.Similarly, vaccines and essential medicines to tackle the above mentioned diseases and health outcomes are usually supplied based on previous history and pattern. Therefore, PHEM will strengthen the existing IDSR to the extent it able to predict climate sensitive diseases future condition, and to prevent and control these diseases effectively. In addition, the existing interventions that directly and indirectly related to climate change sensitive diseases and other health outcomes will be strengthened and qualified to the extent which able to avert and control these diseases and outcomes.

Health professionals and managers at all levels have knowledgeon how to prevent diseases, how to promote health as well as how to treat/manage people infected with communicable diseases through pre-service and in-service trainings. But, having this health knowledge is not adequate to cope with climate change sensitive diseases and health outcomes. Thus, health professionals and managers at all levels will get capacity building on health impacts of climate change and the adaptation measures to be taken depending to the context and with priority to regions or places frequently affected with climate change posed disasters and climate sensitive diseases. The capacity building on health impacts of climate change and adaptive measures to health professionals and managers will be carried out by FMOH in collaboration with Universities and development partners.

Since the health management information system of FMOH reformed 5 years back, significant change has been observed in the HMIS process like using computer to encode dataand generating information at regular interval. However, it was difficult to get adequate data of climate sensitive diseases particularly to leshmaniasis, schistosomiasis, meningitis, etc to see trends of each during desk review of the available documents for the national health vulnerability and adaptation assessment done by FMOH and WHO in 2015. Such incomplete and late information will not compatible with proactive

response required to prevent or minimize adverse effect of climate change posed health outcomes. Therefore, the health management information system has to be strengthened in a way that it will be able to produce timely and quality information for decision making.

This includes establishing data base system and text messaging (SMS) technology which enables data encoders to put data online as well as the health managers to do data analysis and to use the information for timely decision.

7 Key Intervention Areas

The most effective vulnerability reduction measures for health in the near-term are programs that implement and improve basic public health measures such as provision of clean water and sanitation, secure essential health care including vaccination and child health services, increase capacity for disaster preparedness and response, and alleviate poverty (IPCC 5th, WGIII, 2014). The key interventions are selected based on the findings of vulnerability and adaptation assessment findings, the situational analysis done and relevant sustainable development goals are the following:

7.1 Strengthening and Expanding Health Infrastructure

Health as a precondition, indicator and outcome of sustainable development and as part of the post-2015 development agenda, robust efforts are needed to sustain gains made to date and integrate additional health issues into a broad health and development agenda. This new health agenda also requires expanding the scope of health efforts to ensure access to services, prevent exclusion and protect people through the extension of universal health coverage. Experiences also showed that countries would be more vulnerable if they lack basic health services and the capacity for early detection, comprehensive reporting and a rapid response system for public health outbreaks. For countries without these basic health provisions, shocks created by emerging or re-emerging diseases or other events, such as climate change, can lead to even bigger crises (UN and Time for Global Action, 2015).

Therefore, it is crucial to strengthen the existing health facilities to provide quality and to date health services as well as to construct more new health facilities where people are less accessible to health services.The health physical infrastructures themselves need to be climate resilient so that the health facilities willbe ready to provide urgent lifesaving medical care whenever climate posed disaster occurredand withstand climate shock. This includes having standing walls to prevent inland floods, having self-supply of water and energy, having natural and man-made ventilation, etc.

7.2 Strengtheningexisting Integrated Disease Surveillance and Response

Strengthening the capacity for early warning, risk reduction, and management of national and global health risks is important to reduce disaster related morbidity, mortality and economic loss (ICSU and ISSC, 2015). Therefore, strengthening the existing Integrated Disease Surveillance and Response (IDSR) is crucial. Surveillance officers will get capacity building training to on how to use climate data to predict and prevent climate sensitive diseases transmission. This training also enhances health institutions' emergency preparedness and response with emphasis to drought, flood and extreme heat

prone areas since drought, flood and extreme heat could cause some disasters which in turn cause morbidity, physical injuries, mental disorders, and properties' damage and life loss directly as well as induce some disease outbreaks that lead to catastrophic events. Having a strong IDSR, health facilities will be informed to avail medicines to known climate sensitive diseases in time, to develop and use effective vaccines for some climate sensitive diseases, and to allocate adequate budget for activities that prevent and reduce climate change posed diseases and injuries.

Conducting frequent active surveillance of nutrition and climate sensitive diseases based on trends of previous malnutrition and diseases outbreaks as well as national and global climate predictions is also crucial. Accordingly, active surveillance of nutrition will be carried out at places frequently hit by drought such as south and east Tigray, Eastern Amhara, Eastern Oromiya, South Omo, Afar and Somali. Similarly, active surveillance of malaria following floodingand an interrupted rainfall will be carried out in places where hit by flood and malaria is a risk respectively.

Diarrhoea is more prevalent in the low lands due to the fact the humidity there favourable to flies breeding which are usually involved in the transmission of diarrhea in addition to limited availabilities of WaSH facilities there. Moreover, diarrhea prevalence increases in rainy season in general as water sources contaminated by run-off water; and pathogens survive relatively long time during rainy season.Therefore, diarrhea surveillance will be tightened during the rainy season

During drought, people may not get adequate water for domestic purpose especially to keep personal hygiene. Thus, scabies were prevalent in places where hit by El-Ñino caused drought in 2015/2016. Therefore, surveillance of water scarcity diseases such as scabies and trachoma will be tightened during drought events.

7.3 Promoting climate resilient Sanitation facilities

FMOH and its partners will provide practical training on improved and climate proofed sanitation facility options for selected environment health professionals aiming to replicate the sanitation facilities at grass root level. Moreover, improved sanitation facilities especially climate resilient sanitation facilities will be promoted and delivered as an option by FMOH through Health Extension Programme at all levels. A climate resilient latrine options will also be demonstrated at each region by respective regional health bureau with technical assistance from FMOH. Similarly, FMOH will organize experience sharing that encourage waste recycling, waste reuse and waste conversion. Similar experience sharing will be organized by regional health bureaus in their respective region.

7.4 Promoting climate resilient water safety plan

Climate change impacts water availability. Improving water use efficiency and water management has adaptation benefits. Therefore, preventing water scarcity through water conservation and keeping the water available safe is vital to overcome climate change impact on water sources. Climate resilient water safety plan (CRWSP)is an approach to improve both water quality and quantity by identifying existing and potential hazard throughout the water supply system and undertaking remedial action based on risk priorities. To keep water safe, involvement and contribution of relevant sectors is inevitable. The role of health sector in implementing CRWSP is monitoring of water quality at intervals, and promoting safe storage and water treatment at household level. These roles play great in ensuring the quality of drinking water in both regular and emergency times. Therefore, FMOH will monitor

water quality of sample water points at interval, and promote household water treatment and safe storage at national level. Similarly, the health regulatory bodies and HEWs will monitor water quality of water sources and promote household water treatment and safe storage respectively at grass root level. Moreover,FMOH in collaboration with regional health bureaus will provide capacity building in sanitary surveillancewhich will be accompanied with laboratory based water quality testing.

7.5 Promoting Family planning

Despite of the environmental rehabilitation including soil conservation and afforestation have been carried out with full government support in Ethiopia, still there is sever land degradation in major places. Since majority of the people use bio-mass as a source of energy and expanding of land for cultivation due to population pressure, tackling environmental degradation strategically helps to mitigate climate change. Therefore, FMOH will promote family planning services and options of contraceptives all over the country with special attention at vulnerable places where drought recurred, severe land degradation and dense population exist using all means like health extension programme and health development army to curbthe population pressure.

7.6 Revising building codes of health facilities

The average annual temperature globally is increasing and causing warming everywhere. Therefore, a means of cooling is required at hot places where people reside, work and sleep. As a result, FMOH will work with Ministry of Urban Development and Housing (MoUDH) collaboratively in revising building codes of health institutionsso that health institutions will have appropriate engineering design to overcome weather extremes that include having better natural ventilation and plants for shading. This will be applied whileconstructing new one and renovating existing health facilities. Moreover; FMOH will also incorporate a structure of self-supplied water source into the plan of health institutions where no other means of water supply or scarcity of water from common sources during renovation or building of new health institution.

7.7 Promoting climate change mitigation initiatives

Adaptation can reduce climate change risks and bring immediate benefits. But, even with significant resource and institutional investment on adaptation, for the most vulnerable there may be residual risks to food security, access to water, health and human security. There may be limits to adaptation in the long term. And the only way to reduce these risks is through global action to reduce greenhouse gas emissions.Reducing emissions also has multiple benefits – less pollution, less damage to ecosystems, and better health (Climate and Development Knowledge Network, 2014). Therefore, many mitigation actions have significant health co-benefits (ICSU and ISSC, 2015). Thus, the health sector will play its role to achieve zero net carbon emission target of the nation.

Health facilities need to have continuous electric power supply as they have to provide health care service for 24 hours of a day and seven days of a week. Therefore, FMOH in collaboration with MoWIEwill work health facilities to have their own source of renewable energy with priority to health facilities located in place where no access to the main grid of electricity, and to compensate energy interruption from common source. Moreover, hospitals which have remarkable inpatients will generate and use biogas energy from latrines and kitchen wastes for cooking, sterilization, boiling, etc.

Cities that provide infrastructure to encourage walking and cycling could improve the health of their populations. Reducing urban traffic could also improve cardiovascular health and reduce sleep disturbances (Climate and Development Knowledge Network, 2014). Therefore, FMOH will promote and encourages urban dwellers to walk on foot daily and/or to ride a bike since it is helpful practice to prevent some non-communicable diseases as well as to reduce carbon emission. FMOH will also promote and encouragehouseholds to practice gardening and to plant edible fruitsas they havetriple advantages namely a subsistence to household nutrition, providing shading service and absorbing CO_2through HEP and HDA.

7.8 Promoting community health insurance scheme

Ethiopia has launched community based health insurance scheme where all community members get comprehensive health care with minimum payment of membership. Health Insurance Agency (HIA) will expand and strengthen the initiation of community based health insurance scheme for the benefit of the poor and destitute community members through HDAs and civic societies' structures. Since drought and flood prone areas being affected severely as climate change speed up the occurrence of these events and aggravate their consequence, people in these areas being challenged to afford the health expenses individually. Therefore, drought and flood prone areas will get priority while HIA is expanding community based health insurance scheme in the country.

7.9 Advocating and creating awareness on climate change and health

FMOH will advocate climate change effects on health sector to political leaders, policy makers and influential people so that they would play their role in communicating and implementing H-NAP. FMOH and respective regional health bureaus (RHBs) in collaboration with development partners will also provide master training of trainers (MTOT) about climate sensitive diseases, climate posed disasters and adaptation options to whom recruited by regional health bureaus. This training will be cascaded to grass root level by MTOTs and TOTs. FMOHin collaboration with NMA will also train surveillance officers, health experts and metrologists on how to use climate data for diseases surveillance.

The HEWs and HDAs will provide awareness creation to their community on climate change effects on health and adaptation options based on short term training they got and reading materials they collected. This community awareness creation will be supported by messages and discussions transmitted through mass medias like radio and television.

7.10 Encouraging operational research on health and climate change

Since there is little information about the extent of climate change and its impact at micro level, localized operational research on trend of climate change and its impact is important for accurate planning and intervention. Therefore, FMOH and regional health bureaus will encourage and support universities, research institutions and individual researchers to conduct operational research in their respective regions on the contribution of climate change in aggravating climate sensitive diseases, the health impacts of climate change and disasters posed by climate change, endogenous coping mechanisms practiced by communities, etc.

8 Targets

To set the targets below, the water and electricity coverage of the public health facilities, proportion of people live in drought prone areas, and the adaptive capacity of the health sector were considered. Accordingly, here are the targets set on the Table belowto be met in the implementation period:

Table 7: Targets to be achieved in the implementation period

Target	Baseline	Assumptions	Monitoring mechanisms	Responsible body
9 regional states and 2 city administrations will have functional climate change and health technical working group	0	Health bureaus of the respective regions are aware of the importance of establishing functional climate change and health technical working group	Report	FMOH
9 regional states and 2 city administrations health bureaus will have their own vulnerability and adaptation assessment report	0	WHO and other partners will support technically and financially in conducting vulnerability and adaptation assessment	Submitting copy of the assessment report	FMOH/ RHBs
754 health facilities' infrastructure will be re-innovated	NA	Government committed to allocate budget	Annual report and supervision report	FMOH and RHBs
1,126 health posts and 90 health centers will have self-supply of Water (Refer to HSTP)	45%HPs and71% HCs	Government will allocate adequate budget for	Annual report and supervision report	FMOH and RHBs
3,789 health posts and 343 health centers will have self-generated renewable energy	29% HPs and 57% HCs	Fund will be obtained from green fund and other climate change mitigation initiatives	Annual report and supervision report	FMOH, MoEFCC and RHBs
65.5 million people will be sensitized about climate change and health	NA	Government will set it as priority agenda, and Mass Medias will cooperate for	Quarterly report	FMOH, OGCA and RHBS
7,703,040 households will plant shading trees in their compound	15% (estimation)	Government will set it as priority agenda , and MoANR will support technically	Annual report and supervision report	FMOH, MoANR, MoEFCC and RHBs
526 drought prone kebelles will assure community health insurance	NA	Local leaders will committed to mobilize people	Quarterly Report	FMOH and RHBs
The contraceptive prevalence rate will increase to 55%	42%	Local leaders will mobilize households to use contraceptives	Quarterly Report	FMOH and RHBs

9 Budget

The budget stated here below to carry out planned activities that gear to achieving the targets and objectives of national health adaptation plan in the coming four years is minimal as most of the activities will be mainstreamed to the existing initiatives, projects and programmes; and no need additional cost. Of the total budget required to carry out the planned activities, 809,623,200.00 (47.5%)will be covered by FMOH and respective regional health bureaus, and will be invested for social mobilization at grass root level.

Table 6: Budget required in implementation of the planned activities

S.N	Milestone Activities	Budget in Birr			
		Total required Budget in Birr	**Secured Budget In Birr**	**Budget Deficiency in Birr**	**Potential source of budget**
1	Creating Functional Regional Technical Working Group	11,880.00	0.00	11,880.00	WHO
2	Regional Vulnerability and Adaptation Assessment	590,110.00	0.00	590,110.00	WHO
3	Developing regional health adaptation plan	282,830.00	0.00	282,830.00	WHO
4	creating awareness on health effects of climate change and Adaptation options	663,724,650.00	655,836,000.00	7,888,650.00	WHO, CDC
5	promoting climate resilient sanitation facilities	2,697,280.00	0.00	2,697,280.00	UNICEF, GIZ, USAID,World Bank
6	Expanding health service accessibility to natural disaster exposed areas	188,500,000	0	188,500,000.00	UNICEF, GIZ, USAID,World Bank
7	Promoting household water treatment and safe storage	2,837,820.00	0.00	2,837,820.00	WHO,UNICEF, Water Aid,etc
8	Revising and applying climate resilient health facilities building codes	115,065,000.00		115,065,000.00	FMOH, UNICEF, GIZ, USAID,World Bank
9	Promoting climate change mitigation initiatives	653,475,400.00	77,030,400.00	576,445,000.00	FMOH, MoEFCC
10	Expanding Community Health Insurance with priority to drought and flood prone areas	2,073,810.00	0.00	2,073,810.00	CDC, USAID
11	Promoting family planning through HEP and HDAs	76,756,800.00	76,756,800.00	0.00	FMOH
	GRAND TOTAL	**1,704,796,316.00**	**809,623,200.00**	**895,173,116.00**	

10 Resources mobilization

Since the national health adaptation plan will be mainstreamed to routine activities of the ministry, no need to allocate additional resources for most activities indicated in this adaptation plan. However, there are some funding opportunities like Least Developed Countries Fund, Special Climate Change Fund, Adaptation Fund and Green Climate Fund for health adaptation activities which may have budget scarcity. The budget in deficit to implement national health adaptation to climate change would be generated from Ministry of Environment, Forest and Climate Change, and Development Partners.

11 Monitoring and Evaluation

According to logics and previous experiences, immediate results and gradual changes are expected during and after implementing this H-NAP respectively. To obtain the intended outputs, the planned activities have to be implemented using the required resources such as human resource, materials, organizational setup, budget, etc. The outputs in turn also expected to bring intended changes and impacts on community health. Accordingly, the logic model prepared for the H-NAP is illustrated on Figure 14 below.

Health institutions and the regional health sectorwill record baseline information on priority climate sensitive diseases, climate variables (rainfall, temperature, humidity, wind), socio-economic (poverty, demographics and occupation) and current level of interventions and health system capacity prior to starting to adapt climate change effects to measure change after the period of implementation of this H-NAP. The baseline information will be obtained by reviewing documents and/or conducting survey.

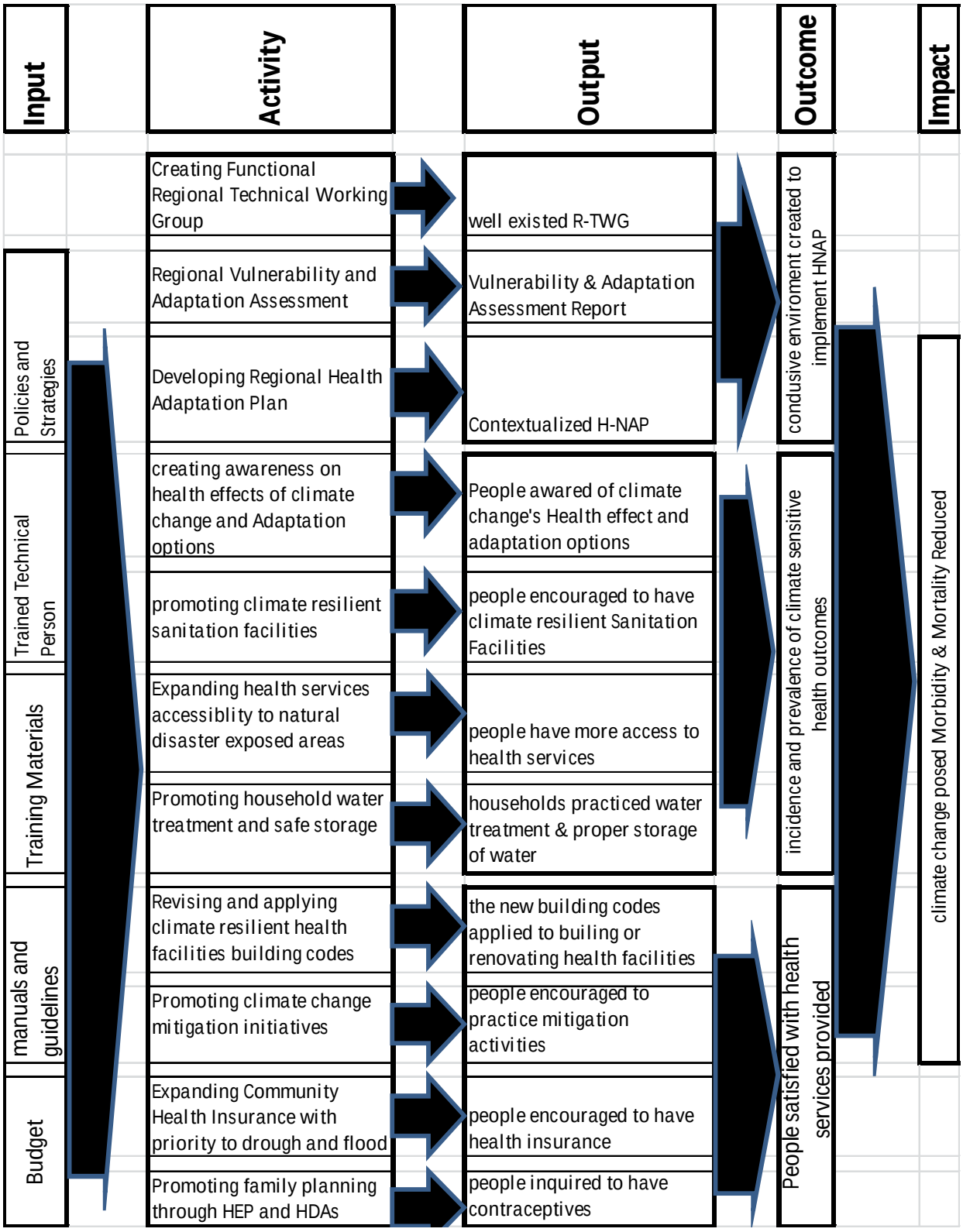


Figure 13: Logic model of H-NAP implementation and expected results

Climate relevant health indicators such as the incidences of climate-sensitive diseases, prevalence of climate-sensitive diseases, climate induced morbidity and climate induced mortality will be incorporated within the national health monitoring system. Moreover, health related indicators such as water supply schemes carrying out water quality monitoring, water supply schemes operating according to CRWSP, proportion of stunted children, proportion of rivers regulated regularly for contamination and households with electricity will be advocated to be incorporated into the adaptation/mitigation monitoring systems of health determining sectors like water, DRMC, environment, energy, etc.

The data/information required to be reported are adaptation activities performed, morbidity and mortality due to climate sensitive diseases, and capacity building activities performed. Health facilities and woreda health offices ought to report to respective higher authorities on monthly basis while regional health bureaus will report every quarter (3 months) to FMOH. Similarly, FMOH will share the compiled report to NAPA and WHO as well as to relevant health programmes to ensure mainstreaming of climate change adaptation.

11.1 Indicators

Process	**Indicators**
Input	Proportion of budget utilized
	Number of guidelines and manuals distributed
Output	Proportion of well existed regional TWGs
	Proportions of RHBs which have their own VA assessment Report
	Number of households (HHs) aware of climate change and health
	% of HHs who encouraged to have improved latrine
	% of health facilities applied the new building codes
	% of households initiated to practice HH water treatment and Safe storage
Outcome	Coverage of HHs with improved latrine
	% kebeles with blanket coverage of community insurance
	Contraceptive prevalence rate
	Number of households who planted trees in their compound
	% health facilities with self-generated renewable energy supply
	% health facilities with self-water supply
	Malaria morbidity rate
	Diarrhoea morbidity rate among children under 5 years
Impact	Life expectancy at birth
	Child mortality rate

Annex 1: Key Intervention Areas with detail Activity, Target, Time frame and Indicative Budget…...

S. No	Key Intervention Area	Activity	Target with unit of measurement	Time Frame				Indicative Budget
				2017	2018	2019	2020	
1	Strengthening and Expanding Health Infrastructure	renovating existing health infrastructure	754 health facilities	X	X	X	X	188,500,000.00
2	Strengthening existing Integrated Disease Surveillance and Response			X	X	X		
3	Promoting climate resilient sanitation facilities	Providing training on improved and climate proofed latrine technology options	41 people	X				1,542,280.00
		Demonstrating improved and climate proofed latrine technology options			X			1,155,000.00
4	Promoting climate resilient water safety plan	Producing and distribution booklet on household water treatment and safe storage	20,113 booklets	X				895,730.00
		developing self-water supply for a health post	1,191 Health posts	X	X	X	X	119,100,000.00
		developing self-water supply for a health center	25 Health centers	X	X	X	X	375,000.00
5	Promoting Family planning	Promoting family planning through HEP and HAD	7,675,680 women	X	X	X	X	76,756,800.00
6	Revising building codes of health facilities	Printing and sharing the new health facilities building codes	1000 booklets		X			
7	Promoting climate change mitigation initiatives	Supplying self-generated renewable energy for a health post	3788 Health posts		X	X	X	378,800,000.00
		Supplying self-generated renewable energy for a health center	343 Health Center		X	X	X	171,500,000.00
		sensitizing households to plant trees in their compound	7,703,040 households	X	X	X	X	77,400,400.00
		promoting and sharing households' experience in caring plants at their compound through radio	29,295,000 households		X	X	X	

		promoting walk on foot and/or riding bike through television spots	8,695,500 households		X	X	X	
		promoting walk on foot and/or riding bike experience through television	8,695,500 households		X	X	X	
		promoting walk on foot and/or riding bike through radio spots	29,295,000 households		X	X	X	
		promoting walk on foot and/or riding bike experience through radio	29,295,000 households		X	X	X	
		bike racing among children, youth and elders in towns	600,000 people		X	X	X	
8	Promoting community health insurance scheme	experience sharing community based insurance among kebelles leaders frequently hit by natural disaster	526 people		X	X	X	1,119,066.00
9	Encouraging operational research on health and climate change	Providing TOT training on V and A to University lecturers	20 people	X				243,710.00
		Providing training on V and A for regional TWG members	120 people	X				346,400.00
10	Capacitating health professionals on climate change and health	Providing TOT training on climate changeand health	38 people	X				319,430.00
		Providing training on climate change and health	2920 people	X				4,373,200.00
		Conducting Advocacy workshop for leaders	93 people	X				229,510.00
		Sensitizing people on health impacts of climate change and adaptation options through face to face communication	65,583,600 people	X	X	X	X	658,786,510.00
		Sensitizing people on health impacts of climate change and adaptation options through television spots	8,695,500 people		X	X	X	
		Sensitizing people on health impacts of climate change and adaptation options through poster	11,383,200 people		X	X	X	
		Sensitizing people on health impacts of climate change and adaptation options through leaflets	13,392,000 people		X	X	X	

Annex 2: References

1. Greenhouse Gas Basics, Climate Change and Agriculture Fact Sheet, Michigan University, 2011, and retrieved fromhttp://msue.anr.msu.edu/uploads/234/62936/Greenhouse_Gas_Basics.pdf
2. Central Statistical Agency Population Projections for Ethiopia 2007-2037, CSA, 2007, and retrieved from http://www.csa.gov.et/images/general/news/icps2012pro_report.pdf
3. Ethiopia's Climate-Resilient Green Economy strategy, FDRE, 2011, and retrieved from http://www.undp.org/content/dam/ethiopia/docs/Ethiopia%20CRGE.pdf
4. Vulnerability and Adaptation Assessment of Health to Climate Change in Ethiopia, FMOH /WHO, 2015
5. Millennium Development Goals Report-Ethiopia, NPC and UN-Ethiopia, 2014, and retrieved from http://www.undp.org/content/dam/ethiopia/docs/EthiopiaMDG%202014%20Final%20final.pdf
6. Health and Health Related Indicators,FMOH, 2011
7. SITUATION ANALYSIS AND NEEDS ASSESSMENT, FDRE, 2010, and retrieved from http://www.unep.org/roa/hesa/Portals/66/HESA/Docs/SANA_docs/SANA-Ethiopia.pdf
8. Health Sector Transformation Plan, FMOH, 2016
9. The geographic distribution of dengue fever and the potential influence of global climate change,Esther et.al, 2010, and retrieved fromhttp://journal.tropika.net/scielo.php?script=sci_arttext&pid=S2078-86062010005000001
10. Review of Targets for the Sustainable Development Goals: The Science Perspective, ICSU and ISSC, 2015, and retrieved from http://www.icsu.org/publications/reports-and-reviews/review-of-targets-for-the-sustainable-development-goals-the-science-perspective-2015/SDG-Report.pdf
11. CLIMATE AND HEALTH COUNTRY PROFILE – 2015 ETHIOPIA, WHO and UNFCC, 2015, and retrieved http://reliefweb.int/sites/reliefweb.int/files/resources/PHE-country-profile-Ethiopia.pdf
12. Protecting Health from Climate Change, WHO, 2008, and retrieved from http://www.who.int/world-health-day/toolkit/report_web.pdf
13. Summary for Policymakers, IPCC 5th , WR III, 2014, and retrieved from https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_summary-for-policymakers.pdf
14. The IPCC's Fifth Assessment Report, What's in it for Africa? Climate and Development Knowledge Network, 2014 retrieved from http://cdkn.org/wp-content/uploads/2014/04/AR5_IPCC_Whats_in_it_for_Africa.pdf
15. HEALTH POLICY OF THE TRANSITIONAL GOVERNMENT OF ETHIOPIA, TGoE, 1993, and retrieved from http://cnhde.ei.columbia.edu/files/4/1/2004-Oct-Tue-040225.pdf
16. RAPID ASSESSMENT OF DRINKINGWATER QUALITY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA COUNTRY REPORT, WHO and UNICEF, 2010, and retrieved from https://www.wssinfo.org/fileadmin/user_upload/resources/RADWQ_Ethiopia.pdf
17. WHO guidelines for indoor air quality: household fuel combustion, WHO, 2014, and retrieved from http://apps.who.int/iris/bitstream/10665/141496/1/9789241548885_eng.pdf
18. Assessing climate change vulnerability in East Africa, Global Water Initiative, 2010, and retrieved from http://www.care.or.ke/images/PDF/GWI_CVCA_CS_Sept11.pdf
19. Local innovation in climate-change adaptation by Ethiopian pastoralists, yohannesGebremichael and MebrahtuKifle, 2009, and retrieved from http://www.prolinnova.net/~prolin/sites/default/files/documents/thematic_pages/climate_change_pid/2009/Ethiopia%20pastoral%20climate-change%20adaptation%20FINAL%20_2_.pdf

20. CLIMATE CHANGE NATIONAL ADAPTATION PROGRAMME OF ACTION (NAPA) OF ETHIOPIA, NMA, 2007, and retrieved fromhttps://unfccc.int/resource/docs/napa/eth01.pdf
21. Addressing Climate Change in the Health Care Setting Opportunities for Action, Health Care without Harm & Practice Green Health, and retrieved from https://practicegreenhealth.org/pubs/toolkit/reports/ClimateChange.pdf
22. Ethiopia Environmental and Climate Change policy brief, Emelie César Anders Ekbom, 2013, and retrieved fromhttp://sidaenvironmenthelpdesk.se/wordpress3/wp-content/uploads/2013/05/Ethiopia-Environmental-and-Climate-Change-policy-20130527.pdf
23. Progress on sanitation and drinking water – 2015 update and MDG assessment, WHO and UNICEF, 2015 and retrieved fromhttp://files.unicef.org/publications/files/Progress_on_Sanitation_and_Drinking_Water_2015_Update_.pdf
24. Preventing disease through healthy environments, A global assessment of the burden of disease from environmental risks, WHO, 2016, and retrieved from http://apps.who.int/iris/bitstream/10665/204585/1/9789241565196_eng.pdf
25. Prevalence and risk factors of malaria in Ethiopia, Ayele et al, 2012, and retrieved from https://malariajournal.biomedcentral.com/articles/10.1186/1475-2875-11-195
26. World Health Statistics, WHO, 2015, and retrieved from http://apps.who.int/iris/bitstream/10665/170250/1/9789240694439_eng.pdf
27. Ethiopia National Malaria Indicator Survey, EPHI/FOMH, 2015 and retrieved from https://www.ephi.gov.et/images/pictures/download2009/MIS-2015-Final-Report-December-_2016.pdf
28. Demographic and Health Survey-Key Indicators Report, CSA, 2016, and retrieved from http://pdf.usaid.gov/pdf_docs/Pnads027.pdf