# PART 1

# 1.0 Introduction

Ethiopia is one of the African countries that located in East African in Sahara region. In case of these there are many flood and drought in Ethiopia.

Topographically, Ethiopia is both a highland/mountainous and lowland country. It is composed of some nine major river basins, the drainage systems of which originate from the centrally situated highlands and make their way down to the peripheral or outlying lowlands. Especially during the rainy season (June-September), the major perennial rivers as well as their numerous tributaries forming the country’s drainage systems carry their peak discharges.

River flooding is a natural process and part of the hydrological cycle of rainfall, surface

and groundwater flow and storage. Floods occur whenever the capacity of the natural or

man made drainage system is unable to cope with the volume of water generated by

rainfall. Floods vary considerably in size and duration. Field-scale flooding is usually due

to intense local storms where water and soil can flow straight off the land surface and

may be over in a matter of hours. With prolonged rain falling over wide areas rivers are

fed by a network of ditches, streams and tributaries and flows build up to the point where

the normal channel is overwhelmed and water floods onto surrounding areas. On large

rivers flooding occur a considerable period after the Rainfall and last for many days or

weeks as the large volumes of water drain out of the catchment.

Taking heed of South-East Asia which is part of the most flood hit continent in the world,

topped the list of disaster impacts over the first 6 months of 2006, with 85% of

worldwide deaths from natural disaster over this period occurring in South-East Asia. An

interesting point to note about the first semester of 2006 is the significant number of

recorded flood disasters, with a total of 113 floods representing all-time high of 65% of

all natural disasters. The first semester average for the preceding 10 years was of 58

floods, representing an average of only 36.5% of all natural disasters. In fact, floods

constitute an increasingly large proportion of all disasters recorded in the EM-DAT

database over the last 50 years Debarati (2006).

In Ethiopia context, the rainy season is concentrated in the three months between June

and September when about 80% of the rains are received. Torrential down pours are

common in most parts of the country. As the topography of the country is rather rugged

with distinctly defined watercourses, large scale flooding is rare and limited to the

lowland areas where major rivers cross to neighboring countries. However, intense

rainfall in the highlands could cause flooding of settlements close to any stretch of river

course. A major river basin that has serious flood problems is the Awash River basin

located in the Rift Valley

## 1.1 Back ground information of Dire Dawa Town

## 1.2 Location

Dire Dawa Administrative Council is located between 9027`N and 9049`N latitude and

41038`Eand 42019`E longitude, and in the eastern marginal catchment of Awash basin

(Fig 3.1). East Hararge Administrative zone of Oromiya Regional State borders it in the

south and southeast and Shinele zone of Somalia Regional State in the north, east and

west. Dire Dawa city is accessible by airplane, train and cars, and is about 515kms road

distance to the east of Addis Ababa and 311kms to the west of Djibouti port.

The total area of the region is about 128,802ha; out of this urban accounts for 2684ha

(2%) and the balance 98% is for rural IDP (2006). The total Dire Dawa area can be

divided in to three major areas; the south and south-eastern part of the city is

characterized by a chain of mountains and upland at the foot of the mountain chain

covering 45%; and low lying flat land accounting for 40% of the land area Ephrem

(2006).

**Figure 1 Map of Dire Dawa Administration Showing the Kebeles and Pas**

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# 1.3 Population

The total population of Dire Dawa is estimated to be 384,000 out of which 74%

(284,000) live in urban while the rest 26%(100,000) live in rural areas.

According to the 1994 census result, Dire Dawa Administration had a total population of

252 thousands during the census period and in the year 2005; the population of the region

has reached 384 thousands which exceeded the census period population by 132

thousands. The incremental within a decade time accounts more than half of the size of

the 1994 population, which is tremendous in magnitude.

On the other hand, the average annual growth rate of the population was 4% for the

region during the years 1995-2000. The growth rate declined to 3.8% for the years

between 2000 and 2005 and expected to further go down to 3.5% for the years between

2005 and 2010 IDP (2006)

1.4 Climate **CHANGE IN DIRE DAWA**

Dire Dawa Administrative Council is situated in Kola agro-climatic region, temperature

is hot through out the year with minor seasonal variations. Temperature progressively

increases northward from somewhat Woina-Dega type along the mountain tops of the

mountain ranges along the southern border and the low alluvial plains in the northwestern

margin experience the lowest and the highest temperature recordings respectively in the

Flooding in any circumstance causes major stresses on the economic, social and

environmental regimes of the affected area. The flooding of 5/6 August 2006, however,

demonstrated that structural measures undertaken so far are not adequate to withstand

flood threats resulting in over 300 fatalities and significant damage to the flood defenses,

public infrastructure, housing and livelihoods in Dire Dawa town.

This paper studied flood risk analysis of Dire Dawa town and flash flood hazard mapping

of Dechatu catchment. To do this an original GIS-based approach was used to build

geodatabase for the selected flood hazard layers and elements at risk (land use and

population density).Then the important factors were developed to a uniform raster layers

with 28.5 m pixel and were masked by the town area in the catchment. Each factor was

standardized and then a pair wise comparison method was used to determine the factor

weights. Then weighted overlay analysis in multi criteria evaluation (MCE) was used to

carry out flood hazard and risk analysis.

DEM and mean annual daily maximum rainfall data were used to make flash flood

hazard mapping using hydro extension version 1.1 in Arc View 3.2 for Dechatu

catchment. Sink filled DEM was used to compute flow direction, flow accumulation,

watershed, mean slope, shape factor, and mean precipitation from raster layer generated

from mean annual daily maximum rainfall. All these parameters were entered into stream

attribute table for characterization. Eight Pour points were computed from the delineated

watershed of Dechatu catchment. Accordingly, Lege Dole, Lege Dechatu, Lege Gogeti

and Lege Ala were the flash flood hazard wadis in the catchment.

The major findings of the paper showed that most of the land use types in the town are

within low to moderate flood hazard and flood risk level. With these Dire Dawa town

flood risk map and flash flood hazard map, Development of future land use in

development policy should be done to decrease the hazard of flooding in Dire Dawa

town.

1.5 Couses of Flood in Dire Dawa Town

water pollution and sanitation problem, exotic weeds and trees and rainy season floodingare some of Soil erosion, land degradation, vegetation loss, over utilization of fuel wood, groundthe environmental problems in the Dire Dawa town and its surrounding arefacing.Accordingly, rainy season flooding is one of the major environmental problems of the people living in Dire Dawa town. High flood, which is normally due to the intensiverainfall in the up lands of the watershed, sparse vegetation cover, steep slopes and lowinfiltration capacity of the ground surface, is a major threat to the people living down

town WWDSE (2003).This flood at times of unusually high rainy days over top the normal flood ways andcreate a lot of calamity to the residents of Dire Dawa town. In the past, several flood

events occurred and caused a lot of distraction on properties and people.

Some people with low income are forced to sprawl over river bed and around the riverbank. The nature of streams of Dire Dawa town which is dry through out the year exceptvery limited number of days, makes the people dwelling on and around the river bed todevelop false security. This has aggravated the flood hazard disaster in the rainy seasons.

Besides, the town land use also has problem on the delineation of flood risk areas for the current and future settlement development program. This is witnessed on the last flood

hazard disaster for instance public service areas like bus station was also damaged**Figure 2 Damages of April 2010 Flood Incident in DDA**

1.6 Effects of Flood in Dire DawaTown

Recently on the night of 5/6 August 2006, a major flood swept through Dire Dawa town,

resulting in over 300 fatalities and significant damage to the flood defenses, public

infrastructure, housing and livelihoods. Although this was the most severe flood for many

years, flash floods occur in the wadis that pass through the town every year, often causing

loss of life and damage to property and infrastructure.

Presently in the existing situation like this, it is important to consider major factors that

contributed most in the past flood hazard calamities. It has of paramount importance to

take notice of these factors to arrive at wise and comprehensive solution towards

mitigating the challenge (that is flooding) which is erratic and unpredictable.Hence, GIS is the best assemblage of computer equipment and a set of computer

programs for the entry and editing, storage, query and retrieval, transformation, analysis,

and display (soft copy) and printing (maps) of the factors (spatial data) affecting flood

hazard. One of the most common approaches in the flood risk and flood hazard study in

other countries is using multi-criteria analysis approach in Geographic Information

System (GIS)

# 1.7 Silt deposit

All roads found with in a radius of approximately up to 40m from the river bed on

average, has been completely covered with silt brought by the flood, and hence, the

traffic movement has been affected till the total removal of sand deposit. The damagecaused due to this is calculated to be 517,100.00 ETB DDRA (2006).

# 1.8 Dechatu Bridge

It is a bridge playing a sole important role in joining the two locally named Kezira and

Dechatu areas. The only means to reach to Dechatu area from all corners of the city is by

using this bridge. The same had been rehabilitated at a cost of 2.4 million birr some year

back, but the flood totally devastated the rehabilitation solution given and has put it in

danger. This damage is estimated to be 3 million birr DDRA (2006). **Figure 3 Petty Market at Kafira Ford, Dechatu Wad**

1.9 Flood protection structures in Dire Dawa Town

The flood protection structures constructed in different flood prone parts of the city has

also been victims of the flood to some extent.

The guide wall found in Kefira area out of its total length 120m has been hit and destroyed by the flood. The damage is estimated to be 950,000.00 ETB. The GTZ settlement area retaining wall has been destroyed some 100m of its total length(850m). The damage is estimated to be 930,000.00 ETB. Dechatu retaining wall in two parts has been hit by the flood. The total length of the affected part is 60m. The damage is estimate and Knowing the future climate variability in Dire Dawa requires further study because it needs to consider different scenario. For this reason, in order to estimate the impact of projected climate change in Dire Dawa, we have applied the national climate change projection report result. Assessment made by NMA (2007) reported that in case of IPCC mid-range (A1B) emission scenario, the mean annual temperature in Dire Dawa will increase up to 1 °C by 2030, 1.8°C by 2050 and 3°C by 2080 compared to the 1961-1990 normal. On the other hand, mean annual rainfall is likely to increase along Dire Dawa by 3.4 % by 2030, 6.4 % by 2050 and 10.5 % by 2080 compared to the 1961-1990 normal. Assessment made on the magnitude and frequency of drought occurrence through community interview and report review evidences that drought hazards have increased in frequency, and magnitude over the last decades. The vegetation cover of DDA is categorized as vegetation of arid and semi-arid lands (highly variable, including cactus scrub, thorn scrub and many wood and sparse grasses formations). There is no climatic climax forest in the region except patches of few junipers remnants in the upper parts and some acacia trees in the low lands. The vegetation of the region is not found in contiguous form covering large area; rather it is seen as fragmented patches of bush land, shrub land and trees in agricultural sites and hillsides.

. The upper reaches of the western part of the escarpment are covered with scattered junipers open woodland with small eucalyptus plantations. Below the escarpment and in the valleys between the ridges is cultivation with eucalyptus homestead wood lots. The ridges are largely devoid of vegetation with only scattered low shrubs and grass land. The plains to the north-east are also bare, whilst those to the south east are covered with low shrub land.

According to the land cover mapping units of DDA, about 9.19 percent of the total land area of the region is covered by physiognomic vegetation; 4.93% prosopis Juliflora plantation, 3.67 % open shrub land and 0.58% dense shrub land. Whereas, the vast area of the region, 60.48%, is an exposed soil, sand or rock with scrubs and grasses. Generally flood protection structures and vegetation conservations are now a day the administration is focused to progress.

**Figure 4 Vegetation coverage (bushes and shrubs) of the Administration **

**Source:** Own source (DDEPA

**1.10 Urban Flood Prevention by the Administrative Council**

The Dire Dawa Administrative Council in alliance with different government and non

government institutions is undertaking some urban flood defense works. This includes

construction of gravity retaining walls along some of the eroded banks of Dechatu and

Goro Rivers to stabilize the slopes and protect property on top of the banks from being

washed out into the river.

# Conclusion sand Recommendations

**Conclusions**

Pair wise comparison method of flood hazard map generation is a good approach to deduce a sound decision for a forthcoming flood disaster, provided the required data are standardized to a common scale in personal geodatabase. This research confirmed the method used was capable to integrate all the flood hazard causative factors and the components of flood risk as well in a GIS environment. In this fashion, composite maps were generated to assess flood risk of Dire Dawa town.

One of the Multi Criteria Evaluation techniques which is known as Weighted Overlay in GIS environment was shown to be useful for delineating areas at different rating in terms of flood hazard and flood risk. Moreover, factor weight computation in Weight module, that is developed by providing a series of pair wise comparisons of the relative importance of factors to the suitability of pixels for the activity being evaluated, has generated valuable information. This could be useful for disaster studies in the future.

# Recommendation*s*

This investigation provides information on flood risk at a town level that could be used by the pertinent decision makers to act upon the current land use policy for in reducing vulnerability to flood disaster in Dire Dawa Town. Thus the responsible bodies of Dire Dawa Administrative Council should incorporate the flood hazard and flood risk maps in the currently ongoing activities related to flood disaster, as one of the short term intervention recommendations of the town is identification of critical flood areas.

There should be an authority responsible for a disaster in the town. Thus set up Dire Dawa Disaster Management Authority (DDDMA) is important. The authority should review the progress of measures based on up-to-date information, check operational readiness for potential flood disasters, and prepare proper measures and action plans.

The authority would also be responsible for managing and coordinating responses and relief

measures during flooding. Regulation of selected flood prone wadis by constructing flood mitigation dams on the selected six pour points is important for multi-purposes. According to Cadwallader

(1986) regulation not only reduce the incidence of and severity of flooding but also decrease long-term average flows downstream. Watershed management practices in the uplands of the catchment are crucial in alleviating future flood disasters in Dire Dawa town. Disaster related research activities should be undertaken. Application of advance techniques in soil physics, geotechnical engineering, GIS and remote sensing for flood risk assessment and risk reduction are also needed.

# PART 2

# 2.0 Drought inAfar Region

**2.1 Introduction**

Drought historically has caused direct and indirect economic, social, and environmental problems throughout the world.[5](http://www.isse.ucar.edu/sadc/chptr3.html" \l "fn5) Some of these problems are difficult to avoid, even with early preparation. However, other ills are avoidable, especially those stemming from poor economic planning and delayed drought response.Socio-economic and environmental consequences of extreme droughts can be as severe as theImpacts of extreme floods, particularly in case of several successive dry years, where smallscale

Farmers risk to lose their land. Drought can undermine the national food security and the Economy, and can, at worst, cause famine (although this should not occur in a well-managed Society). The occurrence and severity of extreme weather, including extreme droughts, can escalate in Case of global warming or general climate fluctuations. The vulnerability may increase in connection with new (but otherwise more attractive) crops, which are introduced in order to save water and increase earnings. On the other hand, even though new crops are always risky, they can sometimes be more drought-resistant than traditional ones, or they can offer a wider range of options for consideration in connection withdelayed rainfall.Surface water supplies are much more vulnerable than groundwater supplies. This circumstance is of little relevance in an operational context, but may be kept in mind in connection withfeasibility studies of groundwater supplies. Access to at least some amount of groundwater (Where available) can ease the damage caused by a drought.

Afar region is one of the four major pastoral regions in Ethiopia located in north eastern part of the country. The region is divided in to five administrative zones, which are further subdivided into 29 woredas. The regional population is estimated to be 1.2 million of which 90% are pastoralists and 10% agro-pastoralists. The majority of the land is rocky and the annual precipitation is low (150-500 mm/annum) which makes crop cultivation unsuitable.

People in the region therefore depend mainly on lives tock production for their livelihood. Drought has become a common phenomenon in the Afar region causing very serious impairment on livestock production, the main source of livelihood for the pastoralists in the Afar region. During the past 5 years, for instance, the region was hit by two severe droughts. The drought in 2002/03 affected all 29 woredas in the region and the on going 2004/5 drought affected most of zone 1, 2 and 4.The current drought occurred so quickly before the range land and livestock fully recovered from the effect of the 2002/03 drought. Failure of the 2004 main rains (Keaerma) which normally occur from July - September suddenly and rapidly induced severe shortage of

livestock feed and water in zones 1, 2 and 4. Pastoralists in these zones were forced to migrate to remote areas including to neighbouring regions (Amhara and Tigray) as early as October 2004 in search of feed and water for their starved livestock. Oxfam International (OI) carried out a rapid field assessment in November 2004.

The assessment study indicated that zone 1,2 and 4 are severely affected by the current drought and confirmed depletion of grazing land, poor livestock condition and massive migration of cattle. The OI assessment team reported that the current problem of the pastoral and agropastoral communities of Afar region is the cumulative effect of the consecutive drought and other factors that have weakened the coping strategies of pastoralist.

Thus unless the root causes of the crisis are identified and addressed properly, responding to the current emergency only will not improve the severe food security and livelihood problems of the community. To this end, Oxfam GB has identified one expatriate consultant (Nutrition/ food security specialist, team leader) and two national consultants (livestock and water and sanitation specialist) to assess the current emergency and livelihood situation in the Afar National Regional State and the team recommended short and long term interventions to reduce deterioration of pastoral livelihood and mitigate the chronic food insecurity in the Afar region.

# 2.2 Assessment Methodology

The assessment team comprised of expatriate nutrition / food security consultant, a veterinary doctor and pastoral expert, and water and sanitation engineer (both consultants). An additional veterinary doctor from ACF joined the team upon arrival in Afar. Translation was provided by one of Oxfam’s local partner organizations, APDA. The teamvisited zones 1, 3, 4 and 5. The assessment incorporated a review of relevant documentation, meetings and interviews with the regional government, woreda authorities, local and international NGOs, UN and Red Cross organizations and discussions with drought-affected communities.

The assessment team identified sample woredas to be visited based on the advice and experience of both the regional government and NGOs. Specific areas visited included wet and dry season grazing areas, water sources and water diversion schemes and agricultural projects. The team also considered management systems of water interventions, and sustainability of the same. Interviews and focus group discussions were held with men and women, migrating and agro pastoralists (i.e. sedentary and nomadic pastoralists). Group discussions were also held in livestock markets with traders and livestock sellers. During the course of the assessment, both UNICEF and Goal were preparing for nutritional surveys.

# 2.3 Back ground

Afar is one of nine regional states situated in the north-eastern part of Ethiopia, it borders Oromiya region in the south, Tigray region and Eritrea in the north, Djibouti and Somalia region in the east, and Amhara region in the west. The altitude of the region ranges from 1500 m.a.s.l. in the western highlands to -120 metres below sea level in the Danakil/Dallol depression. It has an estimated population of 1.2 million of which 90% are pastoralists (56% male and 44% female) and 10% are agro-pastoralists. The livestock population is estimated to be about 4 Million.

Administratively, the region is divided into 5 administrative zones which are sub-divided into 29 woredas. The regional capital, Semera is located in zone 1 (Dubti Woreda) some 600 Kms North-east of Addis Ababa on the main Addis–Djibouti tarmac road. There are 323 rural farmers associations and 32 urban kebeles.

# 2.4 Climate

Afar is characterized by an arid and semi-arid climate with low and erratic rainfall. Temperatures vary from 20’C in higher elevations to 48’C in lower elevations. Rainfall is bi-modal throughout the region with a mean annual rainfall below 500 mm in the semi-arid western escarpments decreasing to 150 mm in the arid zones to the east. Afar is increasingly drought prone. The region receives three rainy seasons. The main rain, *karma* accounts for 60% of annual rainfall and is from mid-June to mid-September. This is

followed by rainy showers in mid-December called *dadaa* and a minor rainy season during March – April called *sugum.* Disruptions on the performance of any rainy season will impact on the availability of pasture and water as well as the overall food security situation of the pastoral and agro-pastoral communities.

# 2.5Drought coping mechanisms among the pastoral Afar community

**By Yakum Negash, Pastoralist Forum Ethiopia (PFE)**

Drought is not a new phenomenon for pastoral communities; Rather it is a central fact of their lifestyle and livelihood. The purpose of this article is merely to share Afar pastoralists’ indigenous knowledge on coping drought incidences, which they have accumulated for centuries, to pastoral actors working on disaster cycle management and related issues. The sources of information used to develop this article range from a research dissertation to direct consultation made with the pastoralists, especially with pastoralists of Dubti Woreda of Afar Region.

# 2.6 Causes and impacts of drought on pastoral lives and livelihoods

There are different definitions regarding Drought. Most authors are of the opinion that Drought is a period of insufficient rainfall resulting in serious damage to crops and other vegetation. It can neither be accurately defined in terms of millimeter (mm) of rainfall nor by the number of days

without rain *.*

Drought according to the world Meteorology organization is a prolonged absence or poor distribution of precipitation and, a period of abnormally dry weather sufficiently prolonged for the lack of precipitation to cause a serious hydrological imbalance. Accordingly, three different types of Drought have been identified.

These are: ***Agricultural drought****:* when rainfall happens to be below the normal to sustain the required soil moisture forcrop growth and development of different growth stages of crops, hence causing total loss of cropor yield reduction;

***Hydrological drought:*** when a prolonged absence of rainfall causes thelowering of ground water table, reduction or total drying of stream flow, depletion of soil moistureand disruption of water supply system; and/or,

***Meteorological drought:*** when rainfall happens to be below normal for a specified period over a specific region.

When a drought occurs, it substantially increases livestock mortality, aggravates the problem of

pastoralists by a condition known as *PriceScissors effect*, where the price of grain increases while that of livestock decreases dramatically. At the socioeconomic level, drought is a function of variables that highly affect the mix of availability of grazing and water resources. A one year or two years failure of rains may result in drought, depending on the resource base of the pastoral system.

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# Drought coping mechanisms among the Afar pastoralists

The Afar pastoralist groups have experienced droughts and other shocks like flood since time immemorial. Recently, the severity of drought has increased its magnitude that it is now becoming difficult for the pastoralists to reconstitute sufficient herd size to help them lead a semi nomadic way of life; and the twin dragons, drought and famine, are giving much pain to the pastoral societies as a whole.

Through time, Afar pastoralists have developed their own coping strategies that can greatly contribute to managing droughts. These drought coping mechanisms vary from one pastoral group to another depending on the type of drought experienced, the type of geographical location, and the resources available to the pastoralists. Some of these strategies are described as follows.

Figure 5 effect of flood on pastorialst



**Lack of livestock is causing food crisis**

According to the Pastoral Zone Leader, 250,000 livestock have died in the last 14 months in Borana alone due to the drought. This has had a huge impact on people's livelihoods and has caused a major food crisis.

Driving out to the remote village clusters I could already see the devastating effects of the drought as we passed dead cattle along the way, lying on dry, red earth. In the Kobibebo cluster most households have recently lost between five and seven cattle each.

The most frustrating thing was that every morning I would wake up to a cover of thick black rainclouds but it just wouldn't open up! Rain relief never came while I was there and still hasn't.

# Current emergency activities

Emergency committees (health, security and relief co-ordination committees) have been established in Zones 1 and 3 of Afar Region. Whereas in Zone 3 the various sub-committees are operational and have re-established access to the cut-off areas, taken measures to prevent malaria spread and organised food and other relief items distributions, in Zone 1 the emergency committee was only established a few days before the mission's visit and no measures and action had yet been undertaken with the exception of warning and informing the local population of the danger of the flood. Furthermore, the mission was told that no immediate relief had been planned for Zone 1 and no outside help was expected. The local people were helping themselves by building papyrus boats to rescue trapped people and livestock.

Evacuation and transport facilities to the cut-off villages in Zone 3 had been made available in the form of three boats and two amphibian military vehicles. During the first days of flooding some rescue operations were also carried out by helicopter. By the time of the mission's visit two of the three boats were out of order and one of the amphibian vehicles was found stuck in the mud. Some food aid deliveries were dropped by helicopter to cut-off areas (3 PAs in Amibara wereda) but most of the 65 tons of wheat delivered by the Federal DPPC were distributed in Melka Sede and brought in small loads to the affected areas. In addition, 180 cartons of military biscuits were delivered for distribution. The Federal DPPC was also in process of sending an additional 100 tons of wheat. Supplementary food for children was not distributed and none is expected. Neither food aid deliveries nor additional transport facilities are available or expected in Zone 1. DPPC sent 20 rolls of UNICEF plastic sheets to Zone 3 for distribution. But apparently plastic sheeting for shelter is not an urgent requirement for the time being.

In Zone 3 the protective dykes built to prevent the water flowing into the commercial agricultural plantations had been breached at several places. Workers and construction equipment, i.e. lorries, excavators etc. had been deployed from nearby state farms and industrial enterprises to reinstate the dykes. At the time of the mission's visit, water was still flowing into crop and inhabited land at a strong and steady pace at one place. All the effort was concentrated to close the one remaining hole in the dyke.

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# 2.7 Problem of dismissed temporary commercial farm employees unsolved

In Zone 3 a significant number of temporary state and commercial farm employees have been dismissed from their jobs due to the flooding and the damage caused to the cash crop plantations. The local authorities counted approximately 7,000 dismissed employees and dependants who have been dislocated by the floods and took, among other places, refuge in 4 schools. These people, for whom (according to government policy) their respective employers are responsible, were compensated for their dismissal with one monthly salary of 120 Birr and a one time donation of 6 kg of wheat per family member. Furthermore, they were told to leave the area and look for work somewhere else.

It is estimated that some 1,500 workers did so, but the remaining and all the dependants were left behind. The local authorities do not feel responsible for them and fear that they might not vacate their school refuge which should have opened for the new Ethiopian school year. Most of these part-time farm workers and dependants arrived many years ago, mainly from overpopulated areas in the south. It is out of question for them to return to their places of origin and most have nowhere to go. Solutions should be discussed among local authorities and farm entrepreneurs for they will not be able to remain in the school compounds.

# Conclusions, recommendations and general remarks

Unfortunately, the whole dimension of the Awash River flooding could not be thoroughly assessed by the mission. For such an overall assessment a helicopter survey would be more appropriate rather than a ground survey as many of the flooded places and areas along Awash river were not accessible by vehicle.

The overall situation seemed to be under control and the Federal DPPC does not seem to be particularly worried, feeling this year's floods were more or less "normal". However, more drugs may be needed to treat malaria, dysentery and other typical diseases related to floods in the affected areas. They seem to be available at the Federal level if required.The mission developed the impression that the Afar authorities and population alike have a somewhat fatalistic attitude towards flooding, especially in Zone 1 around Dubti and Assaita. The floods come every year and is viewed as just part of the game nature plays. Everybody expects it and reacts accordingly.

For state farm operators and private commercial entrepreneurs the yearly overflowing of Awash River is a costly burden. Average production losses caused by the partial flooding of their plantations need to be an integrated part of their profit calculations. They are aware that they are trying to make business on risky ground. For the growing population of semi-settled migrant workers, their situation is clearly becoming more precarious. Obliged to settle in some of the most dangerous locations close to the river, the workers and their families appear to be largely left to their own fate.

Despite considerable investment and effort, the protective dykes broke at several places before the actual water capacity level was reached. That the dykes were breached at so many different places is perhaps not so much due to technical deficiencies in their design as to the growing instability of the river itself as it deposits silt in the lower reaches of its course thereby raising the river bed and increasing the likelihood of a devastating flood. The Ministry of Water Resources Development is currently seeking to implement the "Awash Master Plan" to research and develop ways of overcoming (or accommodating) the problem of periodic flooding in certain areas along the Awash River[[3]](http://www.africa.upenn.edu/Hornet/afar0999.html" \l "fn2).

# PART 3

# 3.0 Flood In Awash River

# 3.1Background information of AwashRiver

The Awash river basin is mostly located in the arid lowlands of Afar Region in the north eastern part of Ethiopia. It frequently floods in August/September following heavy rains in the eastern highland and escarpment areas. A number of tributary rivers draining the highlands eastwards can increase the water level of the Awash river in a short period of time and cause flooding in the low-lying alluvial plains along the river course. Certain areas which frequently, almost seasonally, get inundated are marshlands such as the area between the towns of Debel and Gewane in the vicinity of Lake Yardi and the lower plains around Dubti down to Lake Abe in the administrative Zone 1 of Afar Region. The third area which often floods is the southern part of administrative Zone 3, about 30 kilometres north of Awash town in the vicinity of Melka Werer (see map in annex for geographical location of mentioned places visited).

Afar Region, predominately populated by nomadic and semi-nomadic pastoralists, is generally not known for settled agriculture. But the riverside land, especially the flat lowlands, is fertile and in parts intensively cultivated and relatively densely populated. Certain areas were developed by the former socialist government into large irrigated state farm plantations for production of cotton, sugar and other cash crops and in recent years some of these formerly government operated farms have been taken over by private entrepreneurs. These big farms attracted a considerable number of migrant workers, mostly from overpopulated areas in the southern part of the country, i.e. Wolayita and Gurage, who settled around the farms and whose families arrived a while later.

In previous years, especially in 1996, the lowlands around Wonji, about 10 kilometres south west of Nazareth town and further down the river around Metehara were flooded and state and private owned agricultural plantations were put at risk. In this upper section of Awash river the flooding was usually caused by the release of water from the Koka dam's flood gates which is necessary when the reservoir

reaches its maximum capacity. Unfortunately, in previous years the reservoir authorities experienced difficulties in releasing water in controlled intervals, often causing flooding downstream.

seasons are 'Meher' and 'Belg' and they receive about 80% of the annual rainfall separated by a short dry spell in June. The mean annual rainfall is 657mm and mean monthly values varies between 5.7mm (December) and 119mm (April), which indicate poor temporal distribution of rainfall. The mean annual average air temperature is 25.30 and June is the warmest month of the year while Dece

# 3.2 Flood in Awash

As the topography of the country is rather rugged with distinctly defined watercourses, large scale Flooding is limited to the lowland flat parts of the country. However, intense rainfall in the highlands causes flooding of settlements in a number of river basins. One of these is the Awash River Basin located in the Rift Valley and with a surface area of about 113,000 km2, which has the largest level of development. On the other hand, the level of the waters of two main lakes has been gradually increasing causing damage to infrastructure in a number of areas. Finally, torrential floods are also produced in Addis Ababa and in another main city.

In the lowland areas there is little settlement; the population (pastoralists) and livestock move

Following the presence of grazing and water. Flood spates in these areas are welcome by the

Population as such floods improve grazing and water supply for livestock and people.

The rainy season in the country is concentrated in the three months between June and September,

When about 80% of the rains are received. Torrential downpours are common in most parts of the

Country. Large scale flooding is rare and limited to the lowland areas where major rivers cross to

Neighboring countries. However, intense rainfall in the highlands causes flooding of settlements

Close to any stretch of river courses.

# 3.3 Cases and effect of Awash flood

The most serious flood problems are found in the abovementioned Awash River basin. Irrigation

Development in this basin is quite advanced and is located in the flood plains on either side of the

River, with close to 70% of the country’s large-scale irrigated agriculture; thus, high economic

Damage occurs during flooding. It is estimated that in the Awash Valley almost all of the area

Delineated for irrigation development is subject to floods; this amounts to an inundated surface of

Some 200,000-250,000 ha during high flows.

Flooding along Awash River was mainly caused by heavy rainfall in the eastern highlands and escarpment areas of North Shewa and Welo and not because of heavy rain in the upper watershed areas (i.e. upstream of the Koka Reservoir). Over the years soil and water run-off in the escarpment areas has steadily increased as a result of deforestation, the most serious environmental degradation in the escarpment areas being caused by overpopulation in the highlands.

It was unanimously agreed among interviewed experts, governmental officials and local farmers that the causes of flooding cannot be attributed to the partial release of water from the Koka reservoir upstream It seems that the opening of the flood gates and the partial release of water is now being well managed and did not cause flooding further downstream as in previous years. Warnings were also broadcast through the public media in advance of the planned release of water providing sufficient time for preparations immediately downstream of the dam.

Especially in 1996, the lowlands around Wonji, about 10 kilometres south west of Nazareth town and further down the river around Metehara were flooded and state and private owned agricultural plantations were put at risk. In this upper section of Awash River the flooding was usually caused by the release of water from the Koka dam's flood gates which are necessary when the reservoir reaches its maximum capacity. Unfortunately, in previous years the reservoir authorities experienced difficulties in releasing water in controlled intervals, often causing flooding downstream.

# 3.4 Causes of flooding in Awash river

This year's flooding along Awash river was mainly caused by heavy rainfall in the eastern highlands and escarpment areas of North Shewa and Welo and not because of heavy rain in the upper watershed areas (i.e. upstream of the Koka Reservoir). Over the years soil and water run-off in the escarpment areas has steadily increased as a result of deforestation, the most serious environmental degradation in the escarpment areas being caused by overpopulation in the highlands. Tributaries to Awash river such as Kessem, Kebena, Hawadi, Ataye Jara, Mille and Loqiya rivers contributed most to the lowland flooding in Afar.

It was unanimously agreed among interviewed experts, governmental officials and local farmers that the causes of flooding cannot be attributed to the partial release of water from the Koka reservoir upstream[[2]](http://www.africa.upenn.edu/Hornet/afar0999.html" \l "fn1). It seems that the opening of the flood gates and the partial release of water is now being well managed and did not cause flooding further downstream as in previous years. Warnings were also broadcast through the public media in advance of the planned release of water providing sufficient time for preparations immediately downstream of the dam.

Some observers argue that the dykes constructed by the state farms and private entrepreneurs to protect cropped farm land in the vicinity of the riverbed were not strong and high enough. This may be the main cause of this year's flooding and damage in Melka Werer area. On the other hand, silt is building up rapidly, causing the rise of the riverbed and forcing farm entrepreneurs to raise and reinforce their protective and preventive dykes every year. For communities living in the lowland areas the result is one of growing vulnerability to sudden and potentially catastrophic flooding when the river inevitably breaks through the increasingly unstable dykes. The rise of the riverbed due to silting is causing the Awash river to overflow in places where it never used to overflow.

The vulnerability of the population living along the Awash river and in the marshlands has also been exacerbated due to seemingly inappropriate settlement patterns in these flood prone areas in recent years. Even though most of the settlers are nomadic and semi-nomadic pastoralists and very well aware of the annual flooding and its danger for themselves and their livestock, these particular areas, with their fertile soils and abundant vegetation, are very attractive. Especially during the dry season the riverside areas are the only places in Afar with grazing land and are essential for the survival of humans and livestock. People are voluntarily taking the risk of possibly being trapped by flood. Also, migrants working for the commercial and state farms have established permanent (and often unofficial) settlements close to their places of work and these villages have expanded further with the arrival of the worker's families. As the villages have grown and become permanent, the seasonal movements of people to the Awash farms are no longer as marked as they were a decade ago.

# 3.5 Effects of Awash River Flood

Emergency committees (health, security and relief co-ordination committees) have been established in Zones 1 and 3 of Afar Region. Whereas in Zone 3 the various sub-committees are operational and have re-established access to the cut-off areas, taken measures to prevent malaria spread and organised food and other relief items distributions, in Zone 1 the emergency committee was only established a few days before the mission's visit and no measures and action had yet been undertaken with the exception of warning and informing the local population of the danger of the flood. Furthermore, the mission was told that no immediate relief had been planned for Zone 1 and no outside help was expected. The local people were helping themselves by building papyrus boats to rescue trapped people and livestock.

Evacuation and transport facilities to the cut-off villages in Zone 3 had been made available in the form of three boats and two amphibian military vehicles. During the first days of flooding some rescue operations were also carried out by helicopter. By the time of the mission's visit two of the three boats were out of order and one of the amphibian vehicles was found stuck in the mud. Some food aid deliveries were dropped by helicopter to cut-off areas (3 PAs in Amibara wereda) but most of the 65 tons of wheat delivered by the Federal DPPC were distributed in Melka Sede and brought in small loads to the affected areas. In addition, 180 cartons of military biscuits were delivered for distribution. The Federal DPPC was also in process of sending an additional 100 tons of wheat. Supplementary food for children was not distributed and none is expected. Neither food aid deliveries nor additional transport facilities are available or expected in Zone 1. DPPC sent 20 rolls of UNICEF plastic sheets to Zone 3 for distribution. But apparently plastic sheeting for shelter is not an urgent requirement for the time being. Only very few sheets have been used.

In Zone 3 the protective dykes built to prevent the water flowing into the commercial agricultural plantations had been breached at several places. Workers and construction equipment, i.e. lorries, excavators etc. had been deployed from nearby state farms and industrial enterprises to reinstate the dykes. At the time of the mission's visit, water was still flowing into crop and inhabited land at a strong and steady pace at one place. All the effort was concentrated to close the one remaining hole in the dyke.

Health measures in Zone 3 comprised the establishment of 8 mobile clinics that operate in addition to the local health centres. DDT spraying had commenced in an effort to prevent the spread of malaria. Local authorities feared that the current available drug stock, even with additional supplies from Federal government sources, would not be enough to handle an expected malaria and dysentery outbreak. By the time of the mission's visit, approximately 700 malaria and 340 dysentery cases had been treated. One baby had reportedly died of malaria. But the malaria incidents are rapidly rising. In the week starting 6 September 1999, approximately 100 malaria cases were being reported daily from all over Zone 3.

# 3.6 Others floods in Ethiopia

**SNNPR**

The extraordinary overflow of Omo River in August severely affected about 8,000 people in Dasenech and Gnangatom woredas of South Omo Zone. It has also killed 364 people and swept away some 3,200 cattle and destroyed other properties, including 760 traditional grain stores. This area is one of the worst affected as compared to others In the country. Efforts have been underway to rescue and save the lives of those stranded And also find the bodies of those drowned by the flood. Furthermore, flashflood from Bilate River was reported to have affected 5370 households in Humbo Woreda of Wolayita Zone out of which 2,515 households were severely affected and require Immediate emergency assistance. Moreover, landslides due to heavy rainfall were reported from Guraghe and Kefa zones although their impact was not as serious as that of the floods.

# 3.6.1 Amhara Region

Overflow of Rib and Gomara rivers and Lake Tana in Libo Kemekem And Fogera woredas of South Gonder, Bahirdar Zuria and Bahidar town of West Gojjam And flash floods in Dewchefa and Ansokiya woredas of Oromiya and North Shewa zones, respectively, displaced people from their residential places and forced them to stay under temporary shelter. Currently, there are a total of 13,362 people people reported to be under temporary shelter in the region.

# 3.6.2 West Shewa Zone of Oromiya Region

Flooding of the upper basin of Awash Riveraffected 14 peasant associations (PAs) in Illu, Sebeta Awaso and Ejere woredas of WestShewa Zone. The flood was reported to have affected a total of 14,790 people out ofWhich 2052 people were displaced and forced to live in temporary shelters. On the otherHand, heavy rainfall in the central highlands in the coming weeks is considered as a majorThreat around the major dams in the region (Koka, Gilgel Gibe and Melka Wakena). The dams are already full and contain excessive water. Some of them have already started to overflow.

# 3.6.3 Gambella Region:

Reports of overflow of Baro River have been received from the Region. Areas affected by the flood are Gambella Zuria, Jikawo, Itang and Gillo woredas. So far, the impact of the flood on human beings is not yet serious. However, it has affected a large area of crop fields. Flooding in Gambella is normal but its occurrence at this time of the year is somewhat early. All rivers in the Region are full. High rainfall in the coming weeks in the western highlands could cause severe flooding. Generally, thesituation in the Region is worrisome calling for close monitoring and follow-up.

# 3.6.4 Somali Region:

According to recent information from the Region, as a result of overflow of Wabishebelle River, 3,000 and 4,500 households have been affected from Mustahil and Kelafo woredas, respectively, and a total of 650 hectares of farmland damaged, Which remains yet to be verified?

# 3.6.5 Tigray Region:

Overflow of Tekeze River in Kafta Humera woreda of Western Tigray Zone has displaced 450 households, destroyed houses and damaged crops fields.

# Conclusions, recommendations and general remarks

Unfortunately, the whole dimension of the Awash River flooding could not be thoroughly assessed by the mission. For such an overall assessment a helicopter survey would be more appropriate rather than a ground survey as many of the flooded places and areas along Awash River were not accessible by vehicle. The overall situation seemed to be under control and the Federal DPPC does not seem to be particularly worried, feeling this year's floods were more or less "normal". However, more drugs may be needed to treat malaria, dysentery and other typical diseases related to floods in the affected areas. They seem to be available at the Federal level if required.

The mission developed the impression that the Afar authorities and population alike have a somewhat fatalistic attitude towards flooding, especially in Zone 1 around Dubti and Assaita. The floods come every year and is viewed as just part of the game nature plays. Everybody expects it and reacts accordingly. Those who take too many risks and remain with their cattle in the flood prone areas have to assume the consequences.

For state farm operators and private commercial entrepreneurs the yearly overflowing of Awash River is a costly burden. Average production losses caused by the partial flooding of their plantations need to be an integrated part of their profit calculations. They are aware that they are trying to make business on risky ground. For the growing population of semi-settled migrant workers, their situation is clearly becoming more precarious. Obliged to settle in some of the most dangerous locations close to the river, the workers and their families appear to be largely left to their own fate.

Despite considerable investment and effort, the protective dykes broke at several places before the actual water capacity level was reached. That the dykes were breached at so many different places is perhaps not so much due to technical deficiencies in their design as to the growing instability of the river itself as it deposits silt in the lower reaches of its course thereby raising the river bed and increasing the likelihood of a devastating flood.

The Ministry of Water Resources Development is currently seeking to implement the "Awash Master Plan" to research and develop ways of overcoming (or accommodating) the problem of periodic flooding in certain areas along the Awash River.

# PART 4

# 4.0 SADC REGIONAL PROGRAMME FOR FOOD SECURITY (RPFS)

The desire to address food security problems within a regional context was first

expressed as early as 1980 in the Southern Africa Region, now officially known as the Southern

African Development Community (SADC). In the Declaration: Southern Africa: Towards

Economic Liberation, adopted in Lusaka, Zambia, on 1st April, 1980, the Heads of State or

Government of independent states of Southern Africa committed themselves to pursue policies

for economic liberation and integrated regional development. The Declaration gave rise to the

establishment of the Southern African Development Coordination Conference (SADCC), which

was designed to serve as a vehicle for development and economic integration.

1992 witnessed the restructuring of the SADCC. The adoption of the Declaration and

Treaty of the Southern African Community (SADC) at the August 1992 Summit in Windhoek,

Namibia, marked a potentially major step forward for Southern Africa. There was conviction

among the member states that the region had reached a point where steps towards regional

integration were warranted. Integration was seen as a higher level of cooperation which would

enable countries of the region to address problems of national development and meet the

challenges posed by a rapidly changing and increasingly complex regional and global environment.

Since 1980, areas in which cooperation towards integration have been pursued include:

• Food security, land and agriculture;

• Infrastructure and services;

• Industry, trade, investment and finance;

• Human resources development, science and technology;

• Natural resources and the environment;

• Social welfare, information and culture, and;

• Politics, diplomacy, international relations, peace and security.

The objectives1 of SADC include the following:

• Achieve development and economic growth, alleviate poverty, enhance the standard and

quality of life of the peoples of Southern Africa and support the socially disadvantaged

through regional integration;

• Evolve common political values, systems and institutions;

• Promote and defend peace and security

• Promote self-sustaining development on the basis of collective self reliance, and the

interdependence of member states;

• Achieve complementarity between national and regional strategies and programmes;

• Promote and maximize productive employment and utilization of the region's resources;

• Achieve sustainable utilization of the natural resources and effective protection of the

environment;

• Strengthen and consolidate the long-standing historical, social and cultural affinities and

links among the peoples of the region.

In order to achieve the above objectives, SADC agreed to:

• Harmonize political and socio-economic policies and plans of member states;

• Encourage the peoples of the region and their institutions to take initiatives to develop

economic, social and cultural ties across the region, and to participate fully in the

implementation of SADC programmes and projects;

• Create appropriate institutions and mechanisms for mobilization of resources required for the

implementation of programmes and operations of SADC and its institutions;

• Develop policies aimed at the progressive elimination of obstacles to free movement of

capital and labour, goods and services and of the peoples’ of the region generally, among

member states;

• Promote the development of human resources;

• Promote the development, transfer and mastery of technology;

• Improve economic management and performance through regional cooperation;

• Promote the coordination and harmonization of international relations between member

states;

• Secure international understanding, cooperation, and support, to mobilize the inflow of

public and private resources into the region;

• Develop such other activities as member states may decide in furtherance of the objectives of

# 4.1 SADC Membership

SADC now comprises 14 countries: Angola, Botswana, Democratic Republic of Congo,

Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland,

Tanzania, Zambia and Zimbabwe.

# 4.2 SADC Early Warning System for food securrity

The project is one of the priority areas identified in the SADC Programme of Action in

1980. It is therefore the flagship of the regional food security programme and continues to make

significant progress. Phase 1 of the project started in June 1986 and ended in October 1990. The

Council of Ministers approved a second phase of the project, lasting a further 5 years starting in

early 1991 and ending in September 1995. Phase 3, funded by SADC, is currently underway.

The project intends to improve regional food security through provision of advance

information on the food and nutrition situation to facilitate national and regional policy and

decision making to deal with food shortages, surpluses and problems related to inadequate access

to food. It also provides technical support in the collection, dissemination and use of this

# 4.2.1Regional Food Security Training Project

The first phase of the project commenced in April, 1995 and terminated in December 1999.

Detailed proposals were prepared for a second phase that commenced in January 2000. The aim

of the project is to expand food security related training in the SADC region; strengthen the

capacity of regional training centres to provide in-service training; improve the use of skills and

expertise from within the region; and increase capacity at the regional level to manage training

activities and to support national programmers’

# 

# 4.2.2 Regional Food Security Data Management and Analysis Project

The pilot phase covered four countries, namely Malawi, Tanzania, Zambia and Zimbabwe

from 1995 to 1997. The current phase started in 1999. Both phases have led to the establishment

of information modules in the following areas: food supplies, climatic/weather trends, markets &

prices. The project aims to improve access to essential food security information by stakeholders,

decision-makers and analysts within SADC through efficient storage, retrieval and analysis of

food security information Centre of Communication for Development which assists development organizations and communities working at grassroots level.

4.2.3 Regional Food, Agriculture and Natural Resources Policy Analysis **Network (PAN)**

The SADC FANRPAN was established in 1994 and the SADC Ministers of Agriculture

and Natural Resources designated the University of Zimbabwe to co-ordinate the establishment

of the Network as well as to mobilise funding for a full-time Secretariat. The overall objective

of the network is to help build a sustainable capacity within SADC member states to undertake

policy analysis and research that can be readily utilized for planning, priority setting and to

promote informed and effective policymaking in the field of food, agriculture and natural

resources.

# 4.2.4 SADC Food Security and Rural Development Hub

In 1999, the Council of Ministers approved the Strategy and Business Plan of the Hub, and

urged the FANR Development Unit to implement the project over the three-year pilot phase

starting January 2000. However, commencement was delayed due to logistics. The project

provides a regional resource facility to promote rural development in member States through

capacity building and resource mobilization at local and regional level.

The Hub brings together a pool of regional and international experts based at regional level.

At national level, focal points appointed from Ministries ensure that procedures, policies and

national development needs are followed. They work closely with Permanent Secretaries and

Ministers of Agriculture in developing national programmes and priorities. The work of the Hub

is guided by a regional steering committee consisting of representatives of member States.

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**EXECUTIVE SUMMERY**

In Dire Dawa Administration, program of adaptation to climate change preparation has been a timely opportunity to look at climate change related vulnerabilities in various sectors which are important for the livelihood, ecosystem and natural resource of the area. Since DDA‟s economy is largely dependent on agriculture, service and industry, it is deemed that sustainable development can be achieved when strategic actions, both short term and long term are put in place to address climate change impacts on agriculture and other key economic sectors. For DDA, climate change is not merely an environmental issue defined by precipitation and temperature projections. It represents a serious sustainable development problem that affects its people who are spread across many vulnerable areas. The process of adaptation program preparation involved looking at the effects of climate change as a threat mainly to the agro-pastoralist population that still depends on subsistence agriculture for their daily livelihood and urban population that is still vulnerable to climate change induced flood disaster.

Current climate variability is already imposing a significant challenge to Ethiopia in general and Dire Dawa in particular, by affecting food security, water and energy supply, poverty reduction and sustainable development efforts, as well as by causing natural resource degradation and natural disasters. Prolonged droughts time and again affected the rural part of Dire Dawa. For example the impacts of 2004 and 2005 droughts incident (which posed food shortage to rural population of equal to 85% of the current population figure) is still fresh in the memories of many people. Recurrent Floods in the past caused substantial human life and property loss in many parts of the urban kebele (The August 2006 flood claimed 256 lives, displaced 2,500 families, caused direct damage estimated at ETB 100 million and indirect damage of similar magnitude). These challenges are likely to be exacerbated by anthropogenic climate change.

In this context, the DDA Adaptation program identifies priority areas in various sectors, and further prioritizes response measure and adaption option in those sectors. These activities need immediate and urgent actions for the DDA to adapt to such climate change effects on a short term basis as well as putting in place mechanisms for addressing long-term adaptation initiatives.

DDA Adaptation program has been prepared as part of the overall integrated plans, policies, and programs for sustainable development at regional level. The process not only adhered very closely to annotated action plan approved by FEPA in December, 2010 and elaborated by the national adaption program consultation workshop, but also was conducted in a transparent and participatory manner. The process started with the formation of Regional task forces (adaptation program preparation team) having 10 technical experts and one team leader; total 11 were established from different key sectors of the Administration. This includes; Environment, Agriculture and Rural development, Health, BoFED, Parks andBeautification and Universities. All members of the task forces were drawn from within the Administration.

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