Floods and Health in Gambella region, Ethiopia: An Assessment of the strength and weakness of the coping mechanism

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ABSTRACT

Floods can cause a wide range of health impacts. The major health impact resulting from flooding are injuries, diarrhoeal diseases, vector borne diseases, malnutrition, mental health problems and damage to health infrastructure. Different coping strategies have been used to reduce the impact of floods on human health and property by taking measures before the flood happens, during the flood event and in the aftermath of flood in Gambella region, Ethiopia. The aim of this study is to assess the strengths and weaknesses of the current coping strategies of the Gambella region that aims to reduce flood related health risk. Data for the assessment was obtained through interviews, questionnaire and observation. The assessment of the strengths and weaknesses of coping mechanisms was based on disaster management model suggested by Yesil (2006). Results of interviews with stakeholders group and direct observations in Gambella indicate that lack of skilled man power; low budget; lack of training and updated technology have limited the capacity of the region to implement effective mitigation, preparedness, early response and recovery measures. Furthermore, it was found that the current policy of Ethiopia is silent on accountability, responsibility and coordination of the different organizations during flood disaster. It is imperative therefore to address these challenges in order to make the coping mechanism against flood-related health risks in Gambella more sustainable.

Keywords: floods, health risks, coping mechanism, preparedness, capacity
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ACRONYMS AND ABBREVIATIONS

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<th>Description</th>
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<tr>
<td>FDPPA</td>
<td>Federal Disaster Prevention and Preparedness Agency</td>
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<tr>
<td>GRDPPA</td>
<td>Gambella Regional Disaster Prevention and Preparedness Agency</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
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<tr>
<td>PAHO</td>
<td>Pan American Health Organization</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>UNICEF</td>
<td>United Nation International Children’s Emergency Fund</td>
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<td>UNOCHA</td>
<td>United Nation Office for the Coordination of Humanitarian Affairs</td>
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<td>OFDA</td>
<td>Office of US Foreign Disaster Assistance</td>
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<td>CRED</td>
<td>Centre for Research on the Epidemiology of Disasters</td>
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1. INTRODUCTION

Floods are known as the most frequent and devastating natural disasters in both developed and developing countries (Osti et al., 2008). Between 2000 and 2008 East Africa has experienced many episodes of flooding (OFDA/CRED, 2008). Almost all of these flood episodes have significantly affected large parts of Ethiopia. Being one of the largest countries in East Africa, Ethiopia’s topography characteristics has made the country pretty vulnerable to floods and resulting destruction and damage to life, economic, livelihoods, infrastructure, services and health system (FDPPA, 2007). Gambella region which is found in the western part of Ethiopia has been particularly hard hit in flood incidences. The floods have often resulted in deaths, drowning, communicable diseases, and malnutrition and cause interruption of health service because of the damage to health infrastructure (Gambella Region Health Bureau, 2006).

However different coping strategies have been used to reduce the impact of floods on human health and property by taking measures before the flood happens, during the flood event and in the aftermath of flood (FDPPA, 2007). Despite this effort flood hazards continue to pose multiple risks to human health in Gambella region. In light of this situation one could question the effectiveness of the current coping strategy in the region. This study therefore, set out to assess the strength and weakness of the current flood coping strategies of the region that are aimed at reducing flood related health risks. The study will also make recommendations that can help strengthen the strategies. The result can also be applicable to other regions of Ethiopia with similar problem. The assessment of the strengths and weaknesses of coping mechanism to flood health risk was based on disaster management model suggested by Yesil (2006).

Researches in the field of coping with flood risks have largely focused on economy, livelihood and agriculture; little attention has been given to health dimension of flooding (Ahern et al., 2005, Few, 2003). The fact that this sector has received little attention underscores the necessity of this research. Gambella region was chosen for three reasons: 1) the region is prone to floods 2) No significant research has been done in the region 3) the region is one of the least developed in all aspects including
human resource and infrastructures even when it is compared with other regions in Ethiopia (Young, 1999).

1.1. OBJECTIVES
The objective of this study is to assess the strength and weakness of coping mechanism to deal with flood health risk in Gambella region, Ethiopia.

Specific questions to address the above objectives are:

1. What efforts are being made to cope with floods?
2. What are the strengths and weakness of the coping strategies?
3. What changes are needed in the current strategy in a sustainability perspective?

1.2. Scope and Limitations
This paper concentrates on coping mechanism to flood related health risk rather than health impact of flooding. However, the paper gives background information on the major health impact of flooding in Ethiopia.

Even though economic loss, social disruption and damage to agriculture caused by flooding can directly or indirectly affect the coping mechanisms to flood related health risk, this paper does not address them in depth. Education, another important factor in reducing the health impact of flooding is not fully addressed in this study. While acknowledging that global climate change can affect future flooding, this paper does not discuss it.
1.3. BACK GROUND

1.3.1 Types and cause of Floods in Ethiopia
Ethiopia has a lot of rugged and mountainous topography with altitudes that range 4650 meter above sea level to 420 meters below sea level (Environmental Protection Authority, 2003). The wide variation in elevation means that various climatic conditions exist in Ethiopia. The rainfall also varies from place to place it reaches at average 2400mm/year in the south west and not greater than 150mm/year in the northern part (Environmental Protection Authority, 2003). While other parts of the country have suffered from limited rainfall, other parts of the country have suffered from heavy floods due to the high rain in high land parts of the country. Flooding is common in Ethiopia during rain season between June and September and the major type of flooding which Ethiopia is experiencing are; Flash flood and river floods (FDPPA, 2006).

Flash floods are mainly linked with isolated and localized intense rain fall. It is a short duration event caused by high peak discharge (Few, 2006). The basic and aggravating cause for flash floods are intensity, duration and distribution of rainfall, steep slopes, sedimentation of rivers channels, absence of vegetation, poor soil infiltration capacity, failure of hydrologic (dam, reservoir, etc) structures, sudden release of water from dams, and landslides (Bekele, 1997). This type of flood could pose a big damage to human life and property because they occur suddenly with very high speed (Greenough et al, 2001). There were flash floods in many parts of Ethiopia at different times. An illustrative example of flash floods is the flood that occurred in Dire-Dawa in 2006 which displaced 9,956 people and killed 256 (FDPPA, 2007).

River flood is the overflow of rivers from their banks and extend to low lying areas as a result of intense rainfall or a reduction of the capacity of the river (Douben, 2006). It usually occurs in low land parts of Ethiopia as a result of heavy rains in high land parts of the country. These types of floods build up slowly and the magnitude depends on many factors such as size of the catchments, the intensity of rainfall and amount of precipitation that fall into the water shed and tributaries, topography, the presence and absence of vegetation, anthropogenic activity in the catchments area, drainage basin (Bonacci et al, 2008). According to FDPPA (2006) flood prone areas in Ethiopia are the following: “areas in Oromia and Afar Regional States that constitute the mid and downstream plains of the Awash
River; places in Somali Regional State that fall mainly along downstream of the Wabishebelle, Genalle and Dawa Rivers; low-lying areas falling along Baro, Gilo and Akobo Rivers in Gambella Regional State; downstream areas of Omo River in the Southern Nations, Nationalities and Peoples Regional State; extensive plain fields surrounding Lake Tana and Gumara and Rib Rivers in Amhara Regional State”. (figure1).

![Figure 1: Flood Prone Areas in Ethiopia (source: FDPPA, 2006)](image-url)
1.3.2 Health Impact of Flooding

The adverse health impacts of flooding are very complex (Greenough et al, 2001). The major health impact are deaths, injuries, infectious disease, vector borne diseases, malnutrition, mental health problems and damage to health infrastructure (Ahern et al, 2005, Morgan et al, 2005, Ohl et al, 2000). Deaths due to flooding can occur in different ways and periods. But the most easily recognized ones are deaths caused by drowning and injuries during the onset of flooding (WHO, 2002). This does not mean that flood deaths are only from drowning and injuries. Flood death can also occur due to other health impacts of flooding such as from infectious disease (Schwartz et al, 2006). Flood deaths arising from infectious diseases are higher in developing countries because of the poor sanitation, water supply and poor surveillance and detection (Ohl et al, 2000). Furthermore, deaths due to drowning also are expected to be high in developing countries because of less flood preparedness and flood defenses (Ahern et al, 2006). In general the types of floods also determine the number of deaths from flood. For example flash floods tend to generate greater impact because of it suddenness and speed in which they occur does not allow time for preparedness such as warning and protection against the flood (Greenough et al, 2001). According to OFDA/CRED (2008) database, 119, 156 and 932 flood deaths have occurred in 2003, 2005, and 2006 respectively in different parts of the Ethiopia. But it is important to note that the above mentioned deaths are the reported cases officially. The number of unreported deaths due to infectious disease and malnutrition could raise these numbers.

Injuries can occur before, during and after flooding. It can occur before flooding when people are trying to escape the approaching water. People also injured during the onset of floods mainly they are hit by an object in fast flowing water (Ahern et al, 2006). Also injuries can occur after flood receded when people returned to their homes and business areas and start to clean up the damages (Ahern et al, 2006). There is little information available on injuries caused by flooding in Ethiopia.

Apart from increasing the likelihood of injuries floods also increase the transmission of diarrhoeal disease because floods usually carry pathogen and pollutant which can contaminate food and water source (Hunter, 2003). Flood also can aggravate diarrhoeal disease because it prevents people from observing basic hygiene due to lack of water and latrine because it is not accessible especially during displacement. Diarrhoea out breaks was reported in many parts of Ethiopia following the occurrence of 2005 and 2006 floods (UN OCHA, 2006). The problem of diarrhoea was aggravated in temporary
resettlement camp because of overcrowding and inadequate water and sanitation (Ethiopian Red Cross/Crescent, 2005). Above all the risks of diarrhoea outbreak were high when displaced population returned to their villages. This was because the floods destroyed protected springs, shallow wells and boreholes (Ethiopian Red Cross/Crescent, 2005).

Diarrhoea is not the only the disease that results from flooding. Vector borne diseases also increase in the aftermath of floods. This is due to an increase the vector population, as a more of vector habitats in the form of stagnant pools (Hunter, 2003). The Mosquito is one of the main vector species which transmits malaria, yellow fever and dengue (Kovats et al, 2003). There is always a fear of malaria epidemic after flooding in many parts of Ethiopia following floods because floods create a lot of breeding site for mosquito (FDPPA, 2006). The absence of good disease surveillance in Ethiopia makes it difficult to show how floods affect the pattern of malaria epidemic. According to Hunter (2003) there appears to be a positive correlation between floods and the incidence of malaria.

Significant stress can also result from flood because of damage to property; disrupted livelihoods and loss of social networks (Chae et al, 2005). Several studies indicate that anxiety, depression and sleeplessness have increased among flood victim (Otto et al 2006, Morgan, 2005, Chea et al, 2005). Another study conducted by Kruge et al (1999) in U.S.A. indicates the increase of suicidal rate after flooding. There is no available data on the mental health impact of flooding in Ethiopia.

Malnutrition is also another health impact of flooding. Floods damage crops and inundate of farm land which can lead to food shortages. Floods also damage property and causes displacement of large numbers of people (Ohl et al, 2000). For instance the 2006 flood in Gambella region resulted in, 1650 ha of maize crop damaged. There was also a 20% reduction in production mainly from flood recession farming as result of water lodging on the farm lands (GRDPPA, 2007). Most of the people affected by this flood were very poor and considered highly vulnerable in terms of food security. Though it is difficult to relate flooding and nutritional status with out having prior survey, it is likely that shortage of food caused by flooding in Ethiopia will exacerbate the existing malnutrition problem in the country. Malnutrition in Ethiopia especially among children is very high with 46% of stunting rate and 11% of wastage rate (FDPPA, 2006).
In addition, severe damage to hospitals, health centers and related facilities has been reported in many countries following intense flooding (Orellana, 2002, Anonymous, 2002). In some cases the building of health facility may remain unaffected following a disaster event but its function will be hindered by the damaged caused on non structural facilities such as power lines and water supply, and interruption to internal and external communication system (PAHO, 2000). More importantly the health facility may be inaccessible to the people in need of the service because of flood water (Few et al, 2006). There were reports that the health facilities in some parts of Ethiopia over flooded as a result of heavy rains in 2005 (Ethiopian Red Cross/Crescent, 2005)
2. MATERIALS AND METHODS

2.1 Study Area
Gambella region is one of the regional states in Ethiopia. It is found in the western part of the country bordering on south with Sudan and Oromiya and Southern Nations Nationalities Regional States of Ethiopia (figure 3). It has an area of 25,800 km² with estimated a total population of 247 000 (Kassahun et al, 2008). The region is divided into three administration zones. Again the zones are divided in to eleven woredas (districts) and woredas divided into 220 kebeles; the smallest administrative units.

Gambella is characterized by a variety of elevation. The eastern part has an elevation of 2000- 1000 meter above sea level. The middle part has an elevation of 900-500 meter above sea level and the western part has an elevation of 500- 300 meters above sea level (Woube, 1999). This trend shows a progressive decline from east to west. In general the land in the region is characterized as flat plain.

![Figure 2: Map showing Gambella Region and Rivers in the region (source: Woube, 1999)](image-url)
Animal husbandry is the main economic activity of the region. Also subsistence farming, traditional fishing, hunting, gathering of wild animals and plants are used as source of living in the rural parts of the region (GRDPPA, 2006).

The annual rain fall in the Gambella region ranges between 800-1200mm and it is considered as all year rain fall regime, but about 85% of the rain is between May-October with less rain registered between February- April (Woube, 1999). The average annual temperature of the region is 27.5°C (Kassahun et al, 2008).

Land use change is main contributing factor for increased frequency and magnitude of floods in Gambella region. Unplanned settlement and population increases are major cause for the land use change. Before 1984, Gambella region was occupied by a few indigenous people in sparsely populated settlements (Woube, 1999). However between 1983 and 1996, a total of 733,600 people settled in the region (Woube, 1999). The impact of relocation was that more than 140,000 ha natural forest was cleared and large scale farming also increased in the region in order to meet the needs of the population. This lead to run off and high sediment yield which reduced the water holding capacity of rivers (Old et al, 2006). According to Greenough et al (2001) generally deforestation increases the occurrence of a higher volume run off which can result in flooding in low plain areas.

There are many rivers in the region but the big rivers are Baro, Akobo, Gilo and Alwero that flows through out the year (Woube, 1999). The rivers in the region originate from the high land parts of the country. Most of the people in Gambella live along the river bank which makes them susceptible to yearly flooding. Excessive rains from Gambella and surrounding regions cause rivers to overflow. As a result flooding is most common natural disaster in the region. For example if we examine the last seven years there was over flow of big rivers such as Baro, Akobo, Gilo, Alwero, Jikow, Gnandera and Koikoye in all years except in 2002 (FDPPA, 2007). As a result thousands of people were displaced, crops were damaged and property destroyed (FDPPA, 2007). Figure 3 shows some of the destruction caused by flood in Gambella region.
Figure 3: shows Houses and Crop damaged by Floods in Gambella region.
2.2 Data collection and Data Analysis

2.2.1 Data Collection

Primary and secondary data was used in this study. Secondary data was obtained from relevant literature both published and unpublished, government report, policy documents, health service reports, and Appeal by Disaster Preparedness and Prevention.

Primary data was obtained from different stakeholders such as households affected by floods or subjected to flood, service providers in preventive health (health education and, environmental health) NGOs that are currently working in the region and government departments (water, Disaster Prevention & preparedness Agency, & metrological Agency) at different spatial levels. Primary data was obtained through interviews, questionnaire and observations. I used semi structured interviews to collect information. For in depth information see the appendix 3. The interviews were carried out after pre arranged meeting appointment. The interview was conducted between 14th of January and 15th of February 2008. The interview durations range between 30 to 60 minutes. All interviews were made at their work places. In order to help the interviewee to speak their mind and to get all information without reservation, I did not use tape recorder instead I took notes by taking key words and short sentences. The interviews were made in Amharic and I translated it to English immediately after the interview so that to have a complete documentation of the interview.

A questionnaire survey was employed among thirty five flood victims in Itanga woreda, in Gambella region. For in depth information see the appendix 2. The questionnaire designed to collect information on sanitation condition, source of water supply and to check whether they have mosquito bed net. The questionnaire also includes the issue of resettlement, early warning and emergency preparation. For in depth information see the appendix. Direct observation also was used to assess the sanitation condition of the area and hygienic behavior of the people living in the area. In general it was used to supplement the interview data.
2.3.2 Data analysis

The data was analyzed based on disaster management model suggested by Yesil (2006). The disaster model deals with the ongoing process by which all concerned bodies plan for and try to reduce the impact of disaster before flood disaster happen, take the necessary reactive response during the flood event and take action after flood disaster happen to return affected communities to a more normal condition (Few et al., 2006). Actions taken at each phase play crucial role to reduce the health impact of flooding (Few, 2006). (Figure 4)

The original model by Yesil (2006) lacks the feedback arrow from risk assessment to policy development. So I added this arrow to illustrate not only policy affect risk assessment, but also risk assessment affects or influence policy development. In general the model was criticized “for underplaying the dynamic and often undermining relationship between disasters and ongoing coping capacity that may create spirals rather than cycles of vulnerability, however the model has helped in communicating the importance of a more holistic approach to risk management that does not only depend on relief efforts and humanitarian response” (Few, 2007).
The flood disaster management sequence is divided into two phases (Yesil, 2006). The first phase is called risk reduction phase which includes mitigation and preparedness. Mitigation is long-term activities undertaken prior to impact aimed at reducing the risk or occurrence and/or effect of a disaster (Kovats et al, 2003). Mitigation measures could be structural and non-structural measures which include construction measures, land use planning, institutional measure and public awareness (Wisner et al, 2002, Yesil, 2006). While Preparedness is a pre-disaster activities intended to increase the effectiveness of emergency response during a disaster (Kovats et al, 2003). Preparedness includes forecast, early warning, evacuation and emergency planning (Wisner et al, 2002, Yesil, 2006). The Risk reduction phases starts based on clear policy development followed by risk assessment (WHO, 1999).

Second phase called recovery phase that includes response and recovery measures (Yesil, 2006). Response is any activities undertaken immediately prior to and during an event to protect lives and properties (Kovats et al, 2003). This includes search and rescue, provision of clean water, food, sanitation and hygiene together effective health care service (Wisner et al, 2002, Yesil, 2006). Recovery is a post-disaster activity undertaken to return affected communities to a more normal conditions (Kovats et al, 2003). This includes rehabilitation of water sources, reconstruction of housing with improved local drainage, construction of latrine and psychological rehabilitation (Wisner et al, 2002, Yesil, 2006)
3. RESULTS
The finding of the study is presented based on the sequence of flood disaster management which is policy development followed by risk assessment and then mitigation, preparedness, response and recovery respectively.

3.1 Policy development
The current disaster prevention and preparedness policy of the country does not cover all hazards uniformly (interviewee 1). For instance, in relation to drought and slow onset of disasters, the policy clearly states the responsibility and accountability of all governmental and non governmental organizations in all administrative levels. As a result each organization knows its responsibility, what to do to prevent disaster or what to do after the disaster occurs and the presence of this policy and guidelines has played a significant role to reduce the impact of drought and other slow onset disasters. This is not the case in relation to fast onset hazards such as flood. The policy is silent on accountability, responsibility and coordination of the different organizations responsible for flood disaster management. This policy gap has led to confusion during floods in Gambella especially in respect of emergency response operations. The current health policy of the country does not focus on flood related health risks (interviewee 2). In response to the above mentioned problems, a multi hazard policy strategy is underway that includes floods (interviewee 3).

3.2 Assessing the risk
There was little or no effort made by health sector to determine the risk and vulnerability to disease outbreak in the region from flood hazard (interviewee 4). Lack of capacity, poor documentation and limited financial resources have collectively ensured that no risk assessment has been conducted.

3.3 Mitigation
Mitigation is a long-term and ongoing process that is applied to decrease the effect of the future flooding. Mitigation measures can be structural and non structural measures (Wisner et al, 2002, Carter, 1991).
3.3.1 Structural measures
From direct observations within the areas affected by floods in Gambella and response from interview, no structure measures were taken to protect people and property against flooding. There are two reasons why engineering measures were not undertaken in the past to tackle the issue (interviewee 5 & 6). First, it was beyond the capacity of the region to implement engineering measures in all river banks of the region. Second, in the past flooding was not prioritized as a problem. The focus was instead on problems such as HIV/AIDS and poverty. Lately, however, the increase in frequency and magnitude of the flood has compelled the regional governments to take a critical look at it. It is currently included in the five year development plan of the Gambella region. Yet, the current plan does not consider engineering measures as feasible.

3.3.2 Non structural measures
Non structural measures are measures that focus on reducing short and long term impacts of flood hazard that includes land use planning and institutional measures (Few, 2003).

3.3.2.1 Land use planning and Relocation
The regional administration in Gambella has planned to relocate people from flood prone areas to the safe area on voluntary basis to protect people from flood hazard (interviewee 1 & 5). However, most of the respondents from flood affected individuals in the Itang area said that they do not want resettlement. The main reason they gave relates to the benefit of agriculture productivity they are getting from river banks. Their agriculture system is highly dependent on flooded soil that is very rich in nutrients. They think that living along the river bank can help them to harvest two times a year namely during rain season and the period subsequent to flooding. Therefore, they fear that relocation may not give them the chance to produce two times a year. Moreover currently they are using traditional farming tools such as hoes. These tools may not be suitable for cultivating crops in a new settlement which may not be as productive as their current location.

Contrary to the responses of flood victims, most officials I interviewed agree that relocation is a sustainable solution for protection of lives and property because of the recurrent problem. Much has to be done to raise the awareness of individuals in flood-prone areas about the future impact and consequences of flooding (interviewee 1, 5 & 7). Before implementing the resettlement program, it is very important to introduce new agriculture technology in the new place in order to increase the
agriculture productivity of the people (interviewee 7). Moreover, in order to attract the people to accept
the new safe place, basic facilities and social services including schools, health services, water supply,
and irrigation should be guaranteed (interviewee 7).

Deforestation and over cultivation were mentioned as the main cause for increased magnitude and
frequency of flooding in the region and no significant effort was made to control this problem
(interviewee 1).

### 3.3.2.2 Institutional measures

Gambella region Disaster prevention and preparedness Agency has limited manpower. There is only
one person at woreda level as early warning officer (interviewee 5). Furthermore, some woreda do not
have any early warning officer. For woredas that have early warning officers; these are not
professionals in flood disaster management (interviewee 5). All institution including health services,
within which the research followed, cited limited manpower as a problem. Emphasized should be
placed on training of water professionals to update their knowledge and skills (interviewee 6).

The research findings show that no training was given to health professional in Gambella region
concerning flood hazard management and related issues (interviewee 8 & 9). From the perspective of
some health professionals in Gambella, they would be better prepared to plan properly if they had prior
training on the flood hazard management.

### 3.4 Preparedness

#### 3.4.1 Weather forecast

Generally, there is some improvement in meteorological services in Ethiopia. Nowadays, the service
gives weather forecasts every 24 hours. The agency has opened meteorological offices and stations in
different regions of the country. For example, the Gambella region meteorological agency was opened
in 2005. The forecast is transmitted through radio, television, newspaper and monthly published reports.
The forecast is too general and technical to be understood by ordinary people (interviewee 5). There are
efforts to simplify the forecast. Despite all the above efforts, the agency still has many problems in
relation to making accurate and reliable weather forecast (interviewee 10). It lacks adequate
meteorological instruments, existing instruments are outdated and budgetary allocation is low
(interviewee 10). Added to this, is the issue of lack of communication in the region which has created a
problem in collecting the data from different metrological station on time. Lack of inter-sectoral collaboration was also noted in the region.

3.4.2 Early warning
There is no effective early warning system in place in Gambella region. Most of the respondents in Itang woreda said they had not received any warning from the relevant institutions.

The research found that two key agencies whose function is crucial to the success of early warning mechanisms are not included in early warning committee: Department of Meteorology and the Department of Information (interviewee 5).

3.4.3 Health system preparedness
The health service in Gambella region has no contingency plans (interviewee 8). The region does not have any mental health professionals who can deal with expected mental health problems after flooding (interviewee 6). No plans are in place to encourage the participation of volunteers and to train community health volunteers (interviewee 8).

Majority of the respondents did not have latrine, mosquito bed net and safe water supply. This group of respondents uses the unprotected river for drinking, cooking, bathing and washing clothes. Open defecation and urination is a common practice in the area. The survey indicates that people did not have any information relating to the implication of these unhygienic practices in case of flooding. Overall there was poor environmental health preparedness in advance of flood occurrence to reduce morbidity and mortality resulted from flooding. Budgetary allocation and improper planning is to blame for this state of affairs (interviewee 11 & 12).

3.5 Emergency response
Emergency response in Gambella is hampered by lack of boats, trained swimmers, and life jackets and shortage of medicine (interview 5 & 8). Medecins San Frontieres (MSF) a Switzerland-based NGO played important role in provision of medicine to Itang health center (interviewee 9). The process of buying medicine is bureaucratic and thus hampers the response efforts of the hospital. To buy medicine has to pass through many hierarchical channels which delayed supply of medicine to affected people (interviewee 8).
Water maker and water guard, which are tablets used to disinfect water, were distributed to some flood affected areas. The distribution of the disinfectant tablets did not cover all affected areas due to inaccessibility and inadequate tablets (interviewee 12). The disinfection was however restricted to only drinking water; it did not take into account other domestic uses such cooking and bathing (interviewee 12). Water makers and guard was donated by UNICEF.

The flood-displaced people were forced to stay in temporary shelters such as schools and farm training centers. But these shelters lack basic sanitation facilities such as latrine and solid waste disposal containers. In response to this, there were some efforts by environmental health department and UNICEF to provide these people with the basic sanitation facilities. UNICEF also provided some soaps, pots, plastic plates and blanket but it was not enough for all displaced people (interviewee 12). The sanitation situation was worsened by overcrowding. The displaced people were living in overcrowded situations that aggravated the transmission of contagious disease (interviewee 4).

### 3.6 Recovery

Recovery efforts subsequent to flooding have been made in three main areas: rehabilitation of damaged water sources, psychological rehabilitation, and boosting food security within flood affected communities. In the first instance, the focus has been to locate reservoirs and water sources at higher altitudes in anticipation of future hazards. Despite this effort, the allocated budget for the region does not allow them to increase the safe water supply coverage of the region (interview 6). In the second instance, the thrust of recovery efforts centre on the provision of improved seeds and agricultural inputs to victims (interviewee 5). Most farmers have little or no livelihood diversification. Therefore it is imperative that they are educated to embrace income diversification in order to spread their risks (interviewee 13& 14). In the third instance Psychological rehabilitation has generally been pursued by churches such as Eastern Gambella church, which mainly provides spiritual support to flood victims (interviewee 11).
4. Discussion

Lack of flood-specific policy in Gambella region shows weaknesses in the current coping strategy to deal with flood health risks. The absence of this flood-specific policy in Gambella could lead to confusion in the aftermath of flooding. According to Slaymaker (1999) and WHO (1999) absence of good flood management policy can result in fragmented efforts that lead to poor coordination and results. The absence of policy could be partly due to the fact that flooding was not prioritized because while there were many pressing social problems such as famine killing hundreds of thousands of people in Ethiopia; the impact of floods was rather at the individual level such that it failed to attract the attention of the policy makers and government. This is no longer the case. Flood disaster management policy development is necessary to enhance the achievement of common goals at all levels and to avoid confusion that occur during flood event. Due to lack of policy, there are no clearly defined responsibilities for flood-management related institutions nor is there inter-sector collaboration. According to Wisner et al (2002) the flood disaster management policy should clearly state the responsibilities and roles of all stakeholders. This is particularly important to prevent institutional conflicts. For instance, currently some of the existing river gauges are controlled by the Federal Water Resource, a national agency. But the regional water resource claims that the control of river gauges is their mandate. This situation could potentially lead to conflict between the national agency and its regional counterpart. Lack of extensive risk assessment of vulnerability to flood hazard is another weakness in the current coping mechanism in Gambella region. Assessing the risk and vulnerability can play a major role in identifying the people and property that are at risk to flood hazards (Wisner et al 2002). To a large extent, the lack of risk assessment is tied to the absence of the flood policy because policy is needed to specify the terms of reference for flood management organizations: their specific duties and responsibilities, and the frequency at which risk assessment is carried out. Additionally, according to Macklin et al (2007) flood risk assessment is now a sophisticated venture demanding new technology, computer models, remote sensing and real time forecasting. Gambella by dint of its deprived nature lacks these tools. Third, most developing countries lack good quality data on which vulnerability and risk assessments can be based (Furudada et al 2008). For example, to determine the vulnerability to disease outbreak there should be data on housing, living condition, basic sanitation and history of endemic (PAHO, 2000). However, it is very difficult to find well documented data on these issues in

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Gambella region. I found only one risk assessment carried out only in Itang woreda, Gambella region. This study tried to identify the factors contributing to flooding and prepared flood hazard zone map of Itang area. It also assesses vulnerabilities of different elements at risk but the assessment focus only on few land use types such as building and crop lands. According to WHO (1999), vulnerability assessment should include many of the systems, infrastructure and service as they are very crucial for health care facility. The assessment done in Itang Woreda could be used as a baseline data for implementation of risk reduction if it has assessed all or most of the systems, infrastructure and services at risk in the area.

The coping mechanism to flood health risk was also hampered by lack of adequate health services and limited health professionals’ in Gambella region. For instance the region has only one hospital which caters for a population of 247 000 (MOH, 2006). While Harari region with only 196,000 populations has 5 hospitals (MOH, 2006). There are many reasons why Gambella region is less developed in the health sector and have a shortage of health professionals. First, for long time the region was political marginalized by central government (Young, 1999). Secondly, lack of security or instability in the region due to wars, continued violence and ethnic conflicts in the region has affected the development activities in the region. In addition to the security issues, its remoteness, harsh climatic condition and its lack of basic facilities and infrastructure such as absence of steady electricity, safe water supply, means of communication in the region does not make it attractive for health professionals to come and work in the region (Young, 1999). Moreover, Ethiopia generally suffers from limited number of health professionals. The limited numbers of health professionals in the region also lack professionals training on flood disaster management which is very important in reducing flood related health risks. According to Hus et al (2004) training of hospital staff provides better understanding of disasters and improvement of skills. Further more it helps to discover insufficiency in skills, judgment and information systems, and scarcity of resources (Hus et al, 2004). Therefore it is necessary to strengthen the capacity of the health sector in the region, in order to help the region to cope with flood related health risks. Government should allocate adequate resources to organize seminars, short courses and training related to flood control and prevention. According to PAHO (2000) there are two approaches to provide training about flood disaster management for health professionals; they are continuous training at the institutional level and academic training at undergraduate and graduate level.
Regional government of Gambella has not undertaken engineering measures because Ethiopia, a least developed country can not afford the cost of big engineering measures such as dams and embankments. Few (2003) argues that structural solutions are capital intensive, irrespective of how effective they may be, extensive coverage remains unachievable for many flood-prone developing countries. To institute structural measures the country needs assistance from external development partners. However, most of the time these donors are more responsive to emergency appeal (reactive) than to disaster reduction appeal (proactive) (Yesil, 2006& WHO, 1999). Typical of this trend, a number of NGOs are currently working in Gambella region, yet none of them are involved in proactive activities such as mitigation to reduce the impact of flood hazard. Most of the NGOs are actively involved in emergency response in the aftermath of flooding.

The lack of engineering measures such as dams and embankments could be viewed in a positive light from a sustainability perspective. According to Kundzewicz et al (2000), these structures do not consider the impact on future generation and introduce intolerable instability in ecosystems. They further argue that it gives a false sense of security which could lead to complacency and lack of vigilance on the part of flood-management institutions. However not all structural measures are unsustainable. Small scale and distributed structural measures such as flood proofing, building codes and extending permeable areas are some of the sustainable structural measures (Kundzewicz 1999).

The rejection of the offer of relocation by flood victims in Gambella could be attributed to acute awareness of flood hazard. Most respondents displayed acute awareness of flood hazard during interviews. This result confirms a study conducted in Sri Lanka (Churchill et al 1984). The point of departure however from the Sri Lanka case is that respondents in Gambella ascribed their refusal to relocate to the agricultural benefits that accrues to them from the river bank while Churchill et al found that in Sri Lanka refusal to relocate was tied to cultural factors. The new site for relocation may not necessarily be bad. The respondents are familiar with agriculture that is practiced only in nutrient-rich soil and are not trained to use different agricultural technologies and inputs to improve their productivity. It appears that they are reluctant to relocate because of fear of the unknown.

Literature is divided on the benefits of relocation. One side of the debate contends that if properly applied relocation is the best method for successful reduction of flood risk (Petrow et al, 2006, and Kundzewicz et al, 2000). On the other side of the debate relocation is thought to disrupt social networks and also could lead to serious health problems (Chan, 1995). Relocation of the whole
community is very expensive because the victims have to be provided houses; land, and various social amenities should be installed (Chan, 1995). Given that previous resettlement programmes in other parts of Ethiopia and in Gambella region was poorly planned and was not based on enough study (Woube, 1999) it is necessary for the Gambella regional administration to draw lessons from the previous unsuccessful resettlement programmes.

Relocation may not be a sustainable solution as it could be shifting a problem from one place to other place or from one health problem to other health problem. For example poorly planned resettlement can result in huge loss of forest and other natural resources causing a massive negative impact on environmental sustainability which in turn directly or indirectly affect human health. Therefore the Gambella region could draw lessons from other flood prone countries such Mozambique and Vietnam. For example in Vietnam there is the flood policy that encourages living with floods as a coping strategy for flood hazard. This “recognizes that flooding can not be, nor should be, completely controlled and that efforts should also go into ensuring that communities can cope with, co-exist with and perhaps even exploit floods (Tran et al, 2006). This approach is also used in Mozambique to cope with flood hazard (Cairncross et al, 2006). However there is the need to put the Mozambique and Vietnam cases in context when mapping out the coping strategies in Gambella in order to prevent unintended consequences.
5. Recommendations and Conclusion

5.1 Recommendations

In the first place, the national government should put in place a flood-specific policy immediately in order to give direction to the flood management organizations in Gambella. This is also necessary to prevent duplication of functions and institutional conflicts. In the formulation of the flood-specific policy, all the stakeholders especially the affected communities should be involved in the development of mitigation and coping strategies. This will go a long way to build local capacity in combating flood hazards. Furthermore, policy development process should consider the lesson learned from previous flood disasters in the region.

Next, the regional government should carry out risk assessment in the region to identify the systems, infrastructure and services at risk of flood hazard because once the risks are identified; it will enhance implementation of mitigation and preparedness measures.

Third, NGOs in collaboration with regional government can play a role in implementing sustainable structural measures such as flood proofing in a short term.

Also, building infrastructure such as telecommunications, roads and health facilities should be vigorously pursued by regional government. Given that relocation is capital intensive, the funds allocated for relocation could rather be used to establish such infrastructure

Above all, the institutional capacity of flood management agencies should be strengthened in terms of the training of flood watch monitors and escape route wardens as a short term measure. These volunteers can also be employed as first aid workers in the event of flooding. In the long term, qualified health professionals should be attracted to the area through the provision of incentives.

Finally, further research should be conducted to assess household level vulnerability to flooding and coping strategies to deal with flood related health risk in Gambella
5.2 Conclusion
The current coping strategies against flood-related health risks in Gambella show at least three major weaknesses: weak institutional capacity, poor infrastructure and lack of flood-specific policy. These weaknesses threaten the effectiveness and sustainability of the coping mechanisms. It is imperative therefore to address these challenges in order to make the coping mechanism against flood-related health risks in Gambella more sustainable.

Table 1: Check list to implement Coping mechanism to deal with flood related health risks

<table>
<thead>
<tr>
<th>Problem Related</th>
<th>Priority mark</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy development</td>
<td>Immediate concern</td>
<td>National level</td>
</tr>
<tr>
<td>Risk Assessment</td>
<td>Strategic concern</td>
<td>Regional level</td>
</tr>
<tr>
<td>Infrastructure(Health facility, electricity, communication, road, sanitation facility, safe water supply)</td>
<td>Immediate concern</td>
<td>regional level</td>
</tr>
<tr>
<td>Institutional capacity (resources: money, manpower and material)</td>
<td>Immediate concern</td>
<td>Woreda level</td>
</tr>
<tr>
<td>Literacy</td>
<td>Strategic concern</td>
<td>Regional level</td>
</tr>
<tr>
<td>Inter-sectoral collaboration</td>
<td>Policy development is a prerequisite</td>
<td>National and regional level</td>
</tr>
<tr>
<td>Early warning</td>
<td>Institutional capacity is a prerequisite</td>
<td>National, Regional, woreda, and local levels</td>
</tr>
<tr>
<td>Evacuation</td>
<td>Institutional capacity and Infrastructure are prerequisite</td>
<td>International, national, regional and local levels</td>
</tr>
<tr>
<td>Peace and stability in the region</td>
<td>Strategic concern</td>
<td>International, national and regional levels</td>
</tr>
<tr>
<td>Income diversification</td>
<td>Strategic concern</td>
<td>Woreda and regional levels</td>
</tr>
<tr>
<td>Proactive measures by NGOs</td>
<td>Policy development is prerequisite</td>
<td>National and regional levels</td>
</tr>
</tbody>
</table>
6. REFERENCE


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### 7. APPENDIX

Table 2: shows the name, Organization and position of the interviewee

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Organization</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gizachew Tarekegn</td>
<td>Administration and Social Affairs in Gambella region</td>
<td>Advisor</td>
</tr>
<tr>
<td>2</td>
<td>Abebe Alma</td>
<td>Ethiopian ministry of health</td>
<td>Surveillance expert</td>
</tr>
<tr>
<td>3</td>
<td>Ayele Biyro</td>
<td>FDPPA</td>
<td>Policy Studies Team Leader</td>
</tr>
<tr>
<td>4</td>
<td>Fereda Mosisa</td>
<td>Gambella region Health Bureau</td>
<td>Surveillance expert</td>
</tr>
<tr>
<td>5</td>
<td>Mr Okello Owiti Ojulu</td>
<td>GRDPPA</td>
<td>Head</td>
</tr>
<tr>
<td>6</td>
<td>Mr Melaku Yirga</td>
<td>Gambella region Water Resource Development</td>
<td>Head</td>
</tr>
<tr>
<td>7</td>
<td>Pastor Gilo Gora</td>
<td>Eastern Gambella Betel Senodos, Development and Social Service</td>
<td>Director</td>
</tr>
<tr>
<td>8</td>
<td>Cherent</td>
<td>Gambella Hospital</td>
<td>Medical Director</td>
</tr>
<tr>
<td>9</td>
<td>Jorgo Bati</td>
<td>Itang Health Center</td>
<td>Medical Director</td>
</tr>
<tr>
<td>10</td>
<td>Sisay Bekele</td>
<td>National Metrology Agency Gambella Branch</td>
<td>Head</td>
</tr>
<tr>
<td>11</td>
<td>Endale Liban</td>
<td>Gambella Region Health Bureau</td>
<td>Team Leader Information, Education &amp; Communication</td>
</tr>
<tr>
<td>12</td>
<td>Tamiru Taddese</td>
<td>Gambella Region Health Bureau</td>
<td>Team Leader Health</td>
</tr>
<tr>
<td>13</td>
<td>Abebe Zewedu</td>
<td>World Food Program Gambella region</td>
<td>Senior Program Assistant</td>
</tr>
<tr>
<td>14</td>
<td>Taddesse Bezabeh</td>
<td>UNOCHA Gambella region</td>
<td>Emergency Coordinator</td>
</tr>
</tbody>
</table>
Appendix 2
Questionnaire for Flood victims in Gambella, Ethiopia

1. Name ..............................................................................................................
2. Age: a) 18-25 years b) 26-33 years c) 34-40 years d) above 40 years
3. sex: a) M b) F
4. Income level: a) 205 birr  b) 205-705birr  c) 750-1250birr  d) >1250 birr
5. literacy rate: a) not write and read  b) below grade 6  c) 6-12grade  d) above grade 12
6. Family size……..
7. Living area……..
8. What is your occupation.......................................................?
9. Have you been affected by flooding? Yes …...No…
10. If yes, since you were affected by floods has any members of your family contracted a disease?
11. If yes what disease?
12. which disease is the most common health problem from flooding is serious in your area
13. Did you get any education about basic environmental health measures and safety information? Yes……No……
14. What measures did you put in place to prevent illness or reduce health risk from flooding? A) Boil water b) Wash hand after in contact with flood water c) Drain accumulated water e) Use bed net f) DDT sprays g) Avoid contact with flood water h) Others
15. Did you get any warning from meteorological department prior to the floods? Yes……No……
16. If yes, did you make any emergency preparation prior to flooding? Yes………No …..
17. If yes, for question number 15 through what means: a) Radio b) TV c) Loud speaker d) Newspaper e) other means
18. If yes what type.................................................................
19. What is your water source? a) well  b) spring  c) pipe line  d) river  e) other
20. Do you have latrine? A) yes  b) no
21. If no what do you use?..............................................................................
22. Do you have mosquito bed net? a) yes  b) no
23. If yes how many?......................................................................................
24. Would you like to move to other place: yes…… No……
25. If yes, why...............? If no why................
26. How do you think these situations could be improved?

Appendix 3

Interview question: Health education department

1. Do you have any outreach programmes which centre on precaution and safety measures prior to,
during and subsequent to floods?
2. By what mechanism do you transmit the information to the people
3. Do you collaborate with other concerned institutions?
4. What problems or barriers do you face in your bid to disseminate the necessary information and
to equip the people with knowledge and skill?
5. How do you think these situations could be improved?

Interview question: Environmental health department

1. What environmental health measures are taken before, during and after flooding
2. Do you collaborate with other concerned institutions?
3. What problems do you encounter in your bid to implement preventive environmental health
strategies?
4. How do you think these situations could be improved?

Interview question: water resource department

1. What has been done/will be done to prevent flood water from coming to residential areas?
2. What has been done to protect water source from contamination?
3. What has been done to provide safe water during, and after flooding?
4. Do you collaborate with other concerned institutions?
5. What problems did you encounter in your bid to ensure that floods do not overwhelm
households?
6. What problem did you encounter in your bid to ensure to protect water source from contamination and to provide safe water supply during and after flooding?

7. How do you think these situations could be improved?

Interview question: Medical directors of hospital and health center
1. What emergency preparation has been made to manage the flood induced health problem?
2. Do you have hospital disaster plan?
3. Do you have enough stockpile of medicine for emergency?
4. Do you have enough health personnel especially mental health professionals?
5. Do you collaborate with other concerned institutions?
6. What are the problems/barriers you have to manage the flood induced health problems?
7. How do you think these situations could be improved?

Interview question: Non governmental organization
1. What is the role of your institution in preventing illness/health risk from flooding?
2. What is the level of communication and interaction between you and other agencies to achieve your goals?

Interview question: Ministry of health
Is there any contingency plan for flooding?
Is there any activity to increase the institutional capacity of less developed region
What are the problems/barriers you have to manage the flood induced health problems?
How do you think these situations could be improved?

Interview question: Gambella region metrological agency
1. What is the role of your institution in preventing floods?
2. What is the level of communication and interaction between you and other agencies to achieve your goals?
3. What problems do you encounter in your bid to implement your institutional objectives?
4. How do you think these situations could be improved?

Interview question: for Federal and Regional Disaster Prevention and Preparedness Agency
1. **Is** there specific policies relating to floods?
2. Is there any activity that integrates mitigation practice in to state and local emergency management?
3. What non structural mitigation measures have been taken to prevent risk of floods?
4. What problems do you encounter in your bid to reduce risk and to implement effective emergency response and rehabilitation?
5. How do you think these situations could be improved?
APPENDIX 4: PICTURES SHOWING FLOODING IN GAMBELLA

[Images of flooded areas with buildings submerged in water]