Centre for Environmental Policy and Advocacy

Likely Impacts of Climate Change on Water Availability

Case Study of
T/A Simlemba in Kasungu.

UTVIKLINGSFONDET
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Developed and Designed
Jackie Nankhunda and Dorothy Tembo
Centre for Environmental Policy and Advocacy (CEPA),
P. O. Box 1057
Blantyre
Malawi
Tel: +265 212 700 104
www.cepa.org.mw

1.0 Background and Introduction

1.1 Background

Malawi is endowed with relatively vast water resources while only 5.8% of the annual renewable water resources are used. Water availability, quantity and quality vary greatly according to seasonal and regional differences. Meanwhile water extraction for agricultural and domestic purposes has increased over the last decade due to socio-economic development and population growth. Agricultural irrigation is still the major water extracting sector at 80.6%, followed by the domestic and municipal water supplies at 14.7%, and industry at 4.75% (FAO, 2006).

However, Malawi is highly vulnerable to adverse impacts of climate change and extreme weather events. Over the last three decades, Malawi has experienced a number of adverse climatic hazards. The most serious ones have been dry spells, seasonal droughts, intense rainfall, heat, riverine floods and flash floods. These droughts and floods have increased in frequency, intensity and magnitude and have adversely impacted on food and water security, water quality, energy and sustainable livelihoods of rural communities. These extreme weather events damage infrastructure and housing and occasionally displace significant portions of people. However, it is their effect on agricultural production that is most detrimental to food-insecure Malawi (Karl Pauw et al, 2010).

Abondoned slam in T/A Simulemba, Kasungu District

Abondoned Class block - Chikunkha Primary School, Nsanje District

Withering maize crops in Nsanje (Picture courtesy of CARD)

Since agricultural production in Malawi is predominantly rain fed, droughts cause most of the crops to wither or wilt as such affecting productivity, leading to food shortages, hunger and malnutrition, (GoM, 2006). The

Malnutrition child in Nsanje: picture courtesy of CARD

National Water Policy also acknowledges that the

country's population growth over the years has increased the demand of water for domestic purpose, irrigation, power, transport and other uses. The policy also notes that water resources are being continuously threatened by climate change, over-exploitation, mismanagement, environmental degradation and pollution, (National Water Policy, 2004).

1.2 Justification for selecting Simlemba catchment area

Kasungu District is in the central region of Malawi with an estimated population of 650,103, according to the 1998 Housing and Population Census with an annual growth rate of 3.6 %. The major economic activity in the district is farming, both commercial and subsistence. Apart from agriculture, there is a commercial and industrial sector including retail services, small-scale manufacturing, and construction. Food insecurity is one of the major problems faced by the district. There is more concentration on growing tobacco other than maize and other staple foods. The climate is dominated by distinct wet and dry seasons. Its temperature ranges between the average of 9 and 32 degrees Celsius. The hottest month is October with June as the coldest. Kasungu receives an average annual rainfall of about 763 millimeters with most of the rains falling between December and March and the highest in February. The dominant winds that blow over the township are easterlies (Kasungu Urban Socio Economic Profile).

Simlemba wetland was chosen because it falls along a geographic area which is prone to erratic dry spells and the area is being extensively used for winter cropping by

communities as an adaptation mechanism to adverse impacts of climate change such as droughts. In this area the majority of households are resource poor agriculture dependent, disadvantaged through degraded natural resources, food and economic insecurity as a result of low agricultural production, increasingly frequent drought and a limited asset base.

1.2.1 Simlemba Sustainable Catchments and Wetland Management project in Kasungu

Considering that challenges, traditional authority Simlemba was facing; CEPA, MALEZA and DF implemented a project titled Simlemba Sustainable Catchments and Wetland Management taking advantage of the dwindling wetland due to poor management. The overall goal of the project is to contribute to lasting poverty reduction and improved resilience of wetland dependent communities to the expected climate change scenarios. The project was implemented in 8 villages under Traditional Authority Simlemba. In this area the majority of households are resource poor agriculture dependent, disadvantaged through degraded natural resources, food and economic insecurity as a result of low agricultural production, increasingly frequent drought and a limited asset base. The project built on earlier three-year initiatives titled “Striking a Balance” and ”Simlemba Community Initiative for Sustainable Livelihoods.”

The project intends to influence the National Irrigation Policy and Development Strategy and implementation of the National Adaptation Programme of Action (NAPA) as

well as nongovernmental organizations policies, in order to better recognize the role of wetlands in poverty reduction and the links between poverty reduction and sustainable wetland use. The project promoted a proven innovation approach, Functional Landscape Approach (FLA), which supports civil society to integrate environmental sustainability into community level management, biodiversity conservation and national policy development.

2.0 The possible impacts of climate change on water availability

The following phenomena have already occurred and will be exacerbated by climate change in the Simlemba catchment:

2.1 Livelihood activities

The area of T.A Simlemba is predominantly an agriculture based area; a random survey showed that 37% of the respondents depend on upland field cultivation and 28% practice winter production done along the 5 wetlands in the area. Due to the unreliable rainfall patterns which have rendered upland field cultivation rarely viable, cultivation has shifted in the low lying *dambos*. Other sources of livelihood include upland commercial cultivation, casual labor, livestock production/sale, small scale business and skilled trade/ artisan.

2.2 Winter Crop Performance

Dambo soils are generally more productive than surrounding upland soils because they have amore reliable water supply, and also because they receive eroded soils and nutrients. However; it was observed from the survey that the number of cropping times per winter season has declined to once unlike to twice in the past decade when they just started cultivating the *dambos.* These days *dambos* dry out more quickly before the second crop matures and often dambos tend to dry out at a critical stage when maize is tusselling and requiring more water for cob development. The major factors that contribute to reduced winter crop production

yield are:

(i) insufficient water to carter for the whole winter season (62%)

(ii) lack of farm inputs (38%).

2.3 Vegetative Soil Cover

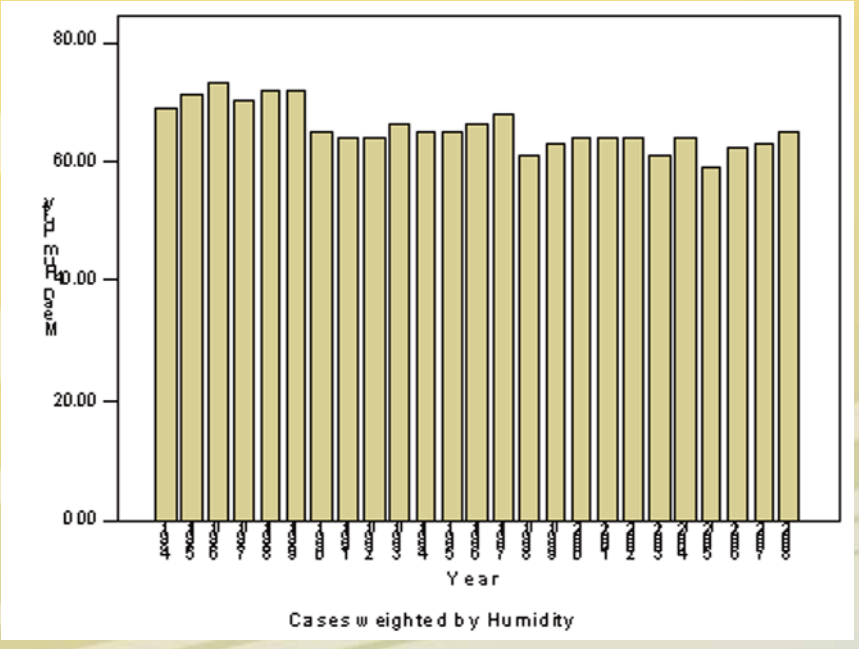
The terrain of Simlemba area is flat and rolling in some areas but with a small gradient dominated with Brachystegia woodlands also known as Miombo woodlands. The Miombo woodlands comprise of grass, medicinal shrubs and scattered trees. Rural residents collect a wide range of essential products from the *dambos* such as water, traditional medicine, mushroom, small wild animals and grass for animal grazing. Apart from providing provisional services to rural communities, dambo also acts as a hydrological store, holding water and releasing it as base flow to its headwater stream during the dry season. Because they retain water, *dambos* support vigorous growth of grass when other forms of grazing are in short supply. Put a photo (here)

Overgrazing and burning of vegetation which is common in the area is detrimental to the lifespan of the *dambos* due to increased water runoff and soil erosion resulting in sedimentation and siltation of the *dambos.* The increase in runoff results in decreased infiltration rates which lowers the water table.

2.4 Climatic Conditions

2.4.1: Humidity

A major factor in water availability is evapo-transpiration

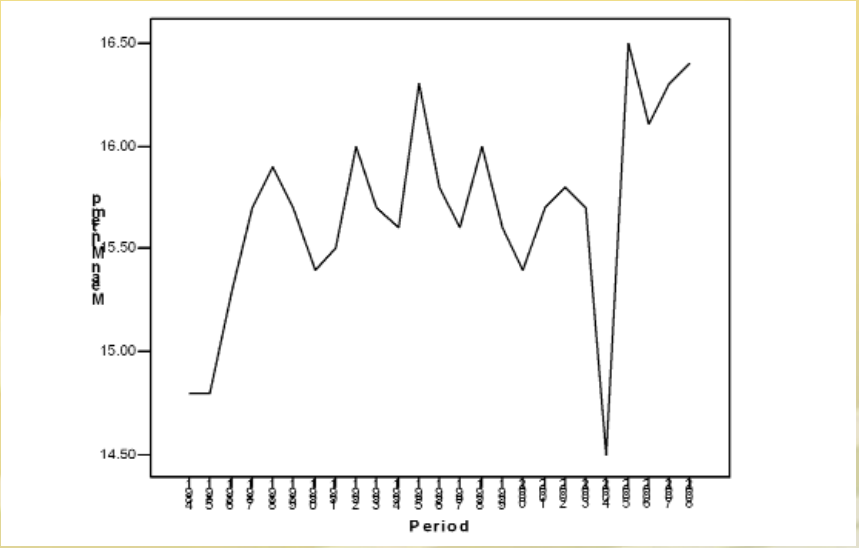


which translates into increased humidity necessary for condensation to take place in the hydrological cycle. The humidity for Kasungu District during 1984 to 2008 has been declining as observed from the data collected from the Department of Climate Change and Meteorological Services. The decrease in humidity may look small however its impact on the annual rainfall is highly significant as shown in the figure.

2.4.2 Temperature variation

2.4.2.1 Mean Minimum Temperatures over the past 25 years

The average minimum temperatures for Kasungu District varied from 14.50C to 16.50C which is above the national minimum temperature of 120C. 75% of respondents revealed that temperature for Simlemba is

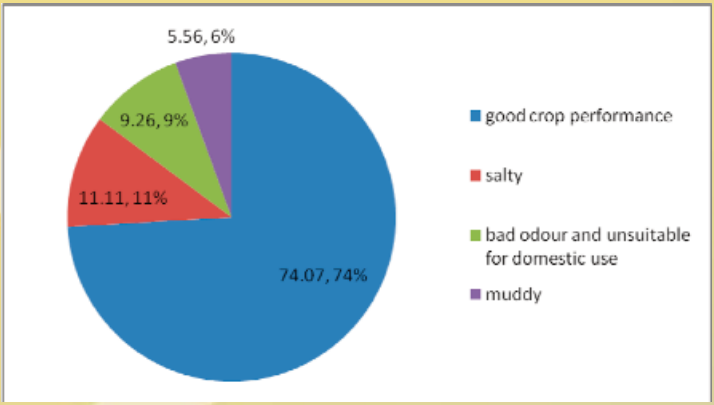


almost very hot throughout the year making it difficult to demarcate between the hot and cold season.

When temperature data is translated alongside rainfall data it can be seen that seasons that pursue seasons where temperatures were high receive an increased amount of rainfall due to increased water being made into the hydrological cycle through evapo-transpiration and the vice versa is observed for seasons that follow seasons of lower temperatures.

2.4.2.2 Mean Maximum Temperatures over the past 25 years

During the past 25 years, the average annual maximum temperatures were within 26.40C to 28.50C which is slightly below the national average maximum temperature. It is worrisome that during the past 3 decades Kasungu was not considered a high temperature area but it is slowly being transformed into one. These



temperatures have made the permanent wetlands into seasonal wetlands due to increased evapo-transpiration.

2.4.3 Water quality

Water in Simlemba wetlands is both good for crop production and domestic use like drinking. However, the variations in climate factors such as temperature and rainfall have an effect on the quality of water. For instance it was noted that heavy rainfall causes water pollution due to chemicals and other waste materials which are eroded from surrounding upland areas. The respondent emphasized that after heavy rains they wait for water to clear before use especially domestic use. On the other hand dry spells coupled with high temperatures are responsible for soil salinity causing the soil moisture not suitable for both crop production and domestic purposes.

2.4.4 Annual Bua River Flow

The droughts of 1992 and five subsequent years significantly reduced the mean annual flow of Bua River up to as low as 5m3/s in 1995.This reduction meant that

the river's capacity to dilute pollutants was greatly reduced hence the water quality was compromised. It can be concluded that the mean annual flow of Bua is still low due to poor rains the district periodically receives.

3.0 What are the key policy issues related to climate change?

- Information on water related impacts of climate change is inadequate – especially with respect to water quality, aquatic ecosystems and groundwater – including their socio-economic dimensions;
- Lack of understanding and modeling of changes in climate related to the hydrological cycle at scales relevant to decision making;
- Current water management practices are not ro bust enough to cope with the impacts of climate change on water supply reliability, flood risk, health, agriculture, energy and aquatic ecosys tems;
- Current tools to facilitate integrated appraisals of adaptation and mitigation options across multiple water-dependent sectors are inadequate.

4.0 CEPA proposed Recommendation

The following are some of the responses and recommendations for dealing with the challenges:

- Changes in water quantity and quality due to climate changes affect food availability, stability and access and utilization are felt first by poor rural farmers. It is therefore imperative to come up with robust policies that integrate climate change issues so that rural communities' ability to adapt to these extreme events is enhanced;
- Re-establish or set up local weather and water level and quality data collection and monitoring centers according in each district;
- Improve accuracy of information by training and equipping local monitors to collect and analyze data for local application;
- It is highly recommended for future studies to assess the water quality parameters such as total dissolved solids, sulfate, nitrate, phosphate, sodium, potassium, and sediment yield;
- Policies should aim at management regimes which help maintain some of the natural char acteristics of wetlands while also allowing partial conversion to allow activities which can meet the economic needs of communities. A balance has to be struck between the environmental functioning of wetlands and their use for livelihood purposes.