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Title of Research Paper: ASSESSMENT OF TRADITIONAL KNOWLEDGE IN USE AS EARLY WARNING SYSTEM ON COMMUNITY ADAPTATION TO DRY SPELLS IN BOLERO MALAWI

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ABSTRACT

Malawi is faced with various climatic changes. Climate change adaptation and vulnerability assessments have shown that communities in Malawi are highly vulnerable to different climate risks including flooding, shorter rain periods, dry spells, and unpredictable onset of rainfall, drought, strong winds and hail storm. Efforts have been made to combat this but however; people are still facing challenges associated with changes in climate. There has been proof that Traditional Knowledge has helped in many areas in solving climate change problems, however Malawi as a country has emphasised much on scientific early warning systems and these scientific early warning systems are not also effective nor are they used on the ground. Local people in Malawi have their own ways and means of predicting the occurrences of disasters in relation to climate change. This research therefore aimed at assessing the use of traditional early warning systems as an adaptation to dry spells in Bolero, Malawi. To achieve the above purpose, the following were the three major objectives; to interrogate the existence of traditional early warning systems in Bolero, to explore the use of the traditional early warning systems in Bolero and to assess the role of the government in promotion of the use of traditional early warning systems. The research used focus group discussions, Key informant interview, and document review. The research hypothesis was that there are some traditional early warning systems in the communities which are currently being used but are not well supported by the government. The major findings were that, there are currently traditional early warning systems in the area but these are not documented and neither are they supported by government except in only five villages where Action AID in partnership with the government of Malawi is implementing its project. The research also found that scientific early warning systems are also not very accessible to the people of Bolero. The research recommends that the knowledge of local people be supported to bring about change where the communities are empowered to combine their knowledge with

scientific knowledge in preparing for disasters associated with changes in climate.

INTRODUCTION

General background

Traditional knowledge is the knowledge that has been used in many areas to solve major social- ecological problems. However, this knowledge of indigenous people is in most of the cases not taken into consideration especially by advocates of climate change adaptation. Pelling (2011: 128) stated that "the impacts of climate change are already being felt and learning how to live with these impacts is a priority for human development, therefore a more profound engagement, which sees climate change risks as a product and driver of social as well as natural systems, and their interaction, is called for". Adaptation to Climate Change argues that without care, adaptive actions can deny the deeper political and cultural roots that call for significant change in social and political relations if human vulnerability to climate change associated risk is to be reduced (Pelling, 2011). Munk & O'Hearn (n.d) critiqued development theory as an approach that does not consider such marginalised groups as indigenous people as being worthy of attention yet it is from them that the efficient development project can be constructed. "A genuine dialogue with indigenous people would demand a radical re appraisal of present development practices as well as a fundamental deconstruction of western social science" (Munk and O'Hearn, n.d). The integration of traditional knowledge into western adaptation mechanisms to climate change therefore calls for transformative change. Reedler (2007) stated that "unlike emergent change, which is characterised as a learning process, transformative change is more about unlearning, of freeing the social being from those relationships and identities, inner and outer, which underpin the crisis and hold back resolution and further healthy development". It is in due course of this that a research was required to unveil the hidden knowledge of indigenous people in Bolero so us to inform western science to realise that transformation is required as an action towards sustainable adaptation to climate change.

Problem statement

Bolero, which is the community of practice, is affected by dry spells which affects livelihood (Mataya, Tembo, Kasulo and Singini 2014). According to Alufeyo Mhango, Disaster Desk Officer in Rumphi (personal communication, 2014) , the impact of dry spells is felt year by year in Bolero because people are not fully prepared in terms of early warning systems. Rumphi district has one Non-Governmental Organisation (Action AID) that is working together with the district council in the implementation of DRM programmes and this NGO also concentrates in one sub section only. Currently the district only depends on warnings originating from the Department of Meteorological Services and various channels of communication are used such as radio broadcasts, newspaper publications (Press Releases), Internet and Circulars. The district is aware of the existence of traditional early warning systems but no effort has been done to support or in cooperate traditional early warning systems together with scientific ones (Mhango, 2014). The undermining of the use of traditional early warning systems results in less or no use of both scientific and traditional knowledge since scientific early warning systems have their own challenges. Scientific knowledge is mainly involves approaches that might as well be in accessible to local people such as radios, and newspapers (Thornberg, 2014).

This research therefore aims at assessing the use of Traditional early warning systems as an adaptation to climate change in Bolero, Malawi .To achieve the main objective, the following are the specific objectives; To interrogate the existence of traditional early warning systems in Bolero, to explore the use of the traditional early warning systems in Bolero, and to inquire the role of the government and stakeholders in promotion of traditional early warning systems.

LITERATURE REVIEW

Background of early Warning Systems

Early warning systems is the provision of timely and effective information through identified structures that allows individuals exposed to hazards to take action to avoid or reduce their risk and prepare for effective response (UNISDR, 2012). Early warning systems are important in predicting the changes that occur in the community. Jost & Hunyandy (2005) stated that early warning systems reduce the number of fatalities due to flash floods, improve the efficiency of Disaster Risk Reduction efforts and play an important role in strengthening resilience to climate change of developing countries in Africa. Early warning systems have proven to be indispensable in preparedness for climatic events like the onset of rainfall, floods, earthquakes, landslides, droughts and related famine, and tsunami (Gretibuo,2009) . Chamvungama, Mawenda and Kambauwa (n.d) stated that in Malawi, there are two drought monitoring early warning systems; scientific based and traditional based. Traditional systems use behaviour of plants and animals, scientific systems are based on indicators derived from variables such as climate, soil moisture, and stream flow (Malawi Government, 2010).

Scientific Early Warning Systems

Scientific early warning systems are based on indicators derived from variables such as climate, soil moisture, and stream flow. Karen, O'Brien & Hochachka (nd) argue that Scientific Early Warning systems are accurate and reliable. Since agricultural activities in Malawi are mainly driven by rain, it means crop production to a large extent depends on right decisions being made on what to plant, when and where which in turn depends much on the accuracy and reliability of seasonal rainfall forecasting. Conventional weather and climate prediction is normally done using statistical and dynamical methods (Ban and Hawkins, 2000). This therefore demonstrates how important is the scientific early warning systems.

Limitations of Scientific early warning systems

On the other hand, scientific knowledge has its limitations. Egeru (2011) states that there are substantial differences between assessments made by scientists and local people who draw their livelihood from those environments. Scientists make use of their own experiences, and interpretations, observations and longstanding experiences and familiarities with a set of local climate indicators (LI-BIRD, undated; Smit and Wandel, 2006: Gbetibuo , 2009; Green and Raygorodesky, 2010; Piya 2012). This works to the disadvantage of the people who are the recipients of these early warning systems especially when scientific knowledge does not apply to that particular community. Okonya & Krochels (2013) argue that scientific early warning systems are not easily available and accessible for use in agriculture, its advantages are not documented in ways that farmers can understand, and they are difficult to interpret and not point specific.

Traditional Early Warning Systems

Traditional knowledge is also known to be as Indigenous knowledge. This is a generic term that consists of the actual knowledge, skills and practices or methods of doing things based on local materials developed through various types of experimentation and practical experience overtime by the people of the place and adapted to the local situation (Nesthikwi, Stingler & Walker, 2013). The term 'indigenous knowledge' is used to describe the knowledge systems developed by a community as opposed to the scientific knowledge that is generally referred to as 'modern' knowledge (Ajibade & Shokemi, 2003).

Successes of traditional early warning systems

Citing the successes of traditional knowledge, Seth et al., (2011) state that Traditional Knowledge has been used to solve major social- ecological problems including those related

to climate change and variability. People living close to natures observe the circumstances around them and are the first to identify and adapt to any changes. Pareek and Trivedi (2011), state that, over the course of history up to this day, people have continued to rely heavily on their own Traditional Knowledge system in observing the environment and dealing with natural disasters. Communities especially those in hazard prone areas have generated a vast body of knowledge on disaster prevention and mitigation, early warning, preparedness, response, and post disaster recovery. This knowledge is often based on cumulative experience handed from generation to generation (Teshome S, n.d.). Traditional Knowledge has also been used by societies in Africa and the rest of the world for various purposes depending on the needs of the society in question. Okonya & Kroschelz (2013) states that Local communities and farmers have developed a rich knowledge base of predicting climatic and weather events based on observations of animals, plants, and celestial bodies, among others. Traditional Knowledge also is easy to be applied in the people's day to day undertakings rather than scientific knowledge which might be difficult for the people to fully understand and utilise. Riedlinger (n.d), states that much of knowledge in predicting climate change is based on scientific finding from modelling, climatology and biology and this climate change data is limited seasonally by luck of historical baseline information hence the need for traditional knowledge.

Challenges associated with Traditional early Warning Systems

Apart from the benefits associated with Traditional Knowledge, some authors have stated that Traditional knowledge has its disadvantages. Mapara (2009) contends that traditional knowledge was denigrated ,despised and ridiculed by the colonialists and portraying their sciences as not only non-empirical but also as primitive, superstitious, backward and living in the dark and thus out of touch with civilisation. Nethiukwi *et al.*(n.d.) stated that certain aspects of IK are very gender-sensitive and may therefore be practiced solely by either men

or women. The other disadvantage with our indigenous knowledge is that it is resident only in the head of the beholder, unfortunately when they die, they die with their knowledge. In the absence of documentation of this knowledge, the surviving generations can only misquote and misinterpret it (Piya, Mahargan &Joshi 2012). Norbiato, Borga, Sangati and Zanon (2007) demonstrates that traditional early warning systems are only momentary but it can work well when combined with scientific forecasts/predictions, they are culture-based and interpreted differently for different areas, they do not provide predictions on the not immediate future and cannot predict mid-season dry spells or their probabilities.

Integration of Scientific and traditional knowledge in disaster preparedness

Based on the above advantages and disadvantages of both scientific and traditional early warning systems, some researchers have argued for the combination of the both traditional and scientific early warning systems. IDSR 2011, states that when it comes to Disaster Risk Reduction, it is important to recognise that government cannot succeed alone and their laws should reflect this. Communities must be empowered to take responsibility for reducing their own risks and influencing decision making and planning in disaster management. Because communities have first-hand experience with the risks that they face, they often have unique insights into how to reduce their own vulnerability. Adger (2003) stated that decisions on adaptation are made by individuals, groups within society, organizations, and governments on behalf of society thus, the effectiveness of strategies for adapting to climate change depend on the social acceptability of options for adaptation, the institutional constraints on adaptation, and the place of adaptation in the wider landscape of economic development and social evolution. According to Norbiato *et al (2007),*a study in Zimbabwe observed that farmers' willingness to use seasonal climate forecasts increased when the forecasts were presented in conjunction and compared with the local indigenous climate forecasts (Boko et al 2007, citing Patt and Gwata, 2002 cited in Nobiato *et al* 2007). Similarly, a study in

Nigeria showed that farmers are able to use knowledge of weather systems such as rainfall, sunshine thunderstorms ,windstorms and haematin(a dry ,dusty wind that blows along the north-west coast of Africa) to prepare for future weather(Ajibade and Shokemi,2003 cited in Nobiato *et al* 2007). Indigenous weather forecasting methods are known to complement farmers planning activities in Zimbabwe. Roncoli *et al* (2001) observe that a similar study in Burkina Faso showed that farmers' forecasting knowledge encompasses shared and selective experiences. Generally, elderly people formulate hypothesis about seasonal rainfall by observing natural phenomena while cultural and ritual specialists draw predictions from divination, dreams or visions (Mutasa, 2011). The President of the International Fund for Agricultural Development, Nwanze (2010), argues that local communities should be empowered to blend traditional knowledge systems with modern technology as a step to launch an evergreen revolution. The acknowledgement of the importance of IK falls in line with some development thinking which looks at local communities as beholders of valuable knowledge that can help in their development (Mutasa, 2011).

Indigenous knowledge and transformative change

Muchena &Williams (1991), argue for the importance of identifying, collecting and developing indigenous knowledge. They posit that educators can move from the familiar to the unfamiliar, from the concrete to the abstract in the process of promoting sustainable agriculture, starting with the farmers' indigenous knowledge. Indigenous knowledge can also be used to predict the amount of rainfall for that agricultural season, and inform the farmers' cropping activities. This is especially common in cases where conventional weather information is not easily accessed. *The Herald* of November 4, 2010, contends that farmers should listen to the daily, weekly and monthly weather forecasts and consult Agricultural Extension Officers (Agritex) as part of their planning efforts. This of course is the ideal

situation. However, not all farmers, especially those in remote areas, have access to radios and other media communicating weather forecasts, let alone having the capacity to interpret them. This is where Agritex officers should come in to fill the gap, but the situation on the ground defies this logic. Faced with this unfortunate possibility, it is sensible to call for the marriage of local knowledge and modern science as applying them in isolation might eliminate the complementarities that should help make the farmers succeed in the farming business.

IIED Briefing (2011), states that researchers agree that adapting agriculture to impacts of climate change is a priority for ensuring food security, however, strategies to achieve this in practice tend to focus on modern science. Evidence both old and new suggests that the traditional knowledge and crop varieties of indigenous peoples and local communities could prove even more important in adapting agriculture to climate change. According to ISDR Briefing (2011), in 2010, parties to UN framework convention to climate change adopted a decision on enhanced action on adaptation that identified the need to draw on Traditional Knowledge as well as best available science. The greater majority of Malawians live in rural areas and are less dependent on weather information from the Malawian Meteorological Agency for decisions on their livelihoods. Majority of them depend on their own understanding of times and seasons which have worked for them for many years. This knowledge, wisdom and practices of indigenous people which has been accumulated, preserved and transmitted in a traditional and inter-generational context over a long period is one resource that can be harnessed to complement contemporary scientific weather forecasting and implementation of coping strategies in Malawi's disaster risk reduction efforts. Unfortunately, efforts in this direction is virtually absent in disaster risk management.

The importance of traditional knowledge in predicting changes in climate cannot be overemphasised. Mutta, 2011 states that Traditional Knowledge can help to forecast local

weather, predict extreme events, and provide accessible information to farmers, at a scale which can be more useful at local level than sophisticated models and can also monitor climate change in specific locations, and fill the resolution gap of scientific models. Climate models often provide information at a scale too large to be of use when planning what to plant and when at the farm scale (Mutta *et al.*, 2011).

It should not be surprising that indigenous knowledge is the basis for local-level decision-making in many rural communities in many a country. It has value, not only for the culture in which it evolves, but also for scientists and planners who are striving to improve conditions in rural localities. Incorporating indigenous knowledge into weather forecasting and climate change policies can lead to the development of effective adaptation strategies that are cost-

METHODS

Bolero has a population of over 11, 710 farm families. The main livelihood is subsistence Agriculture which accounts for 65% of the income of the rural poor. The average land is 2.5 acres per household. EPA office is 16 km towards the west of the district bordered by: Mhuju EPA to the east, Katowo EPA to the west, Nyika national part to the north and Mwazisi sub EPA to the south. The EPA has a population of 58,550 people, with an average of 5 persons per household. The EPA has 12 sections, 112 villages (listed at the DC office), 11710 farm families *(*Rumphi FISP data 2013*)* with average of 2.7 ha as land holding size per family *(FIDP PE3 impact assessment report 2009).*

The study was done in Bolero EPA and five group village headmen were sampled. These were Mlongoti, Mzato, Bolero and Gowoka. The study was conducted from 11th to 19th January 2015 and it was purely qualitative and the five village headmen (communities) were selected purposively because they were the areas mostly hit by dry spells. Within the five

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Group village headmen, three villages were sampled based on the geographical position of the villages hence there were fifteen villages sampled.

The data collection methods that were employed were Focus Group discussions, key informant interviews and desk research. There were fifteen focus group discussions conducted and each focus group had attendance of minimum of 9 and maximum of twelve. The Focus group discussions were comprised of community leaders involved in different community projects and these committees were; women committee members, health, agriculture, disaster and development committees. The youth leaders were also involved. On average, the group discussions focused on forty percent women, twenty percent youth and forty percent male. The data collected through these interviews was general information about disasters, common disasters in bolero, how it affects them, how they prepare and how they minimise the impact. There was also information concerning existence of early warning systems, how they use them and how they are supported by government and other stakeholders.

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The Key informant interviews focused on mainly the Chiefs, District Agriculture Development Officer (DADO), the Agriculture Extension Development Coordinator, the Agriculture Extension Development Officers, and some elderly people who had information about traditional early warning systems. In each and every village where the focus group discussions were conducted. There was Document Review conducted. This entails documentation from oral history, reports, research publications, and past research studies on indigenous knowledge on dry spell early warning systems.

The study first held meetings with key people at the district level (involved in drought management and users of the Scientific Early warning systems) before proceeding on exhaustive field visits, in the COP. At the district level, the meetings were held with key

stakeholders that includes officials from key Government line ministries and NGOs. Their views were sought and analysed in order to get in-depth understanding of the scientific and traditional EWS currently being used in the COP. The data was analysed through table (matrix) stating the answers from each group. Apart from the table, the other common ideas from the key informant interviews and desk study have been listed down in the findings chapter below. The questionnaire carried out information on the common disasters experienced in bolero, understanding of draught by the communities, how the people are affected, how they reduce and prepare for dry spells.

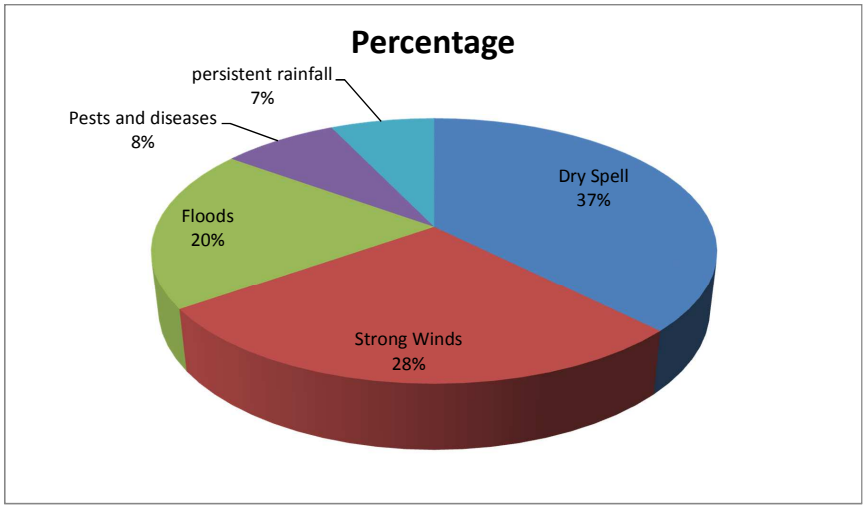
PRESENTATION OF THE FINDINGS

The research was based on three main objectives and these were; to explore the existence of early warning systems in Bolero EPA, to assess the use of Early warning systems in Bolero EPA and to assess the role of government and other stakeholders in supporting the use of these Traditional Early warning systems. In addition, apart from the objectives, general information about disasters was also collected. The following is therefore the presentation of the findings;

General information about disasters.

In relation to the situation in Bolero, 95 percent of the respondents stated that Dry spells are the most common disasters while fifty percent talked of floods and seventy percent mentioned of strong winds which were observed from December 2014 to January 2015. The other disasters that came out were pests and sometimes persistent rainfall which does not only lead to floods but makes the crops to rot because of failing to contain too much water.

Figure 1. Pie chart showing percentages of general disasters in Bolero EPA



On their understanding of dry spells, the respondents described them as a season of less or no rains. Others described them as rain that comes for a short period of time, persistent sunrise, and absence of rains for 3 consecutive months.

On the effects of dry spells, 90 percent of the respondents stated that dry spells have a direct effect on crops. The whole population in Bolero rely on farming as a major source of income and livelihood and once crops are hit by dry spells, the whole population is affected. In response to this, people set by laws of preserving the environment as well as growing diversified crops. The activities which they are involved in includes; tree planting, early planting and early cultivation and growing of early maturing varieties.

Existence of Traditional Early Warning Systems.

The respondents were asked on the existence of both Traditional and scientific early warning Systems. Among the respondents, 13 GVHs stated that they do not have any scientific early warning systems in place while only in two GVHs; they stated that they have an early warning system which was developed with support from Action AID. On Traditional early

warning Systems, all the 15 villages accepted the existence of traditional early Warning systems. These early warning systems are listed in the table below.

Table 1. Traditional Early Warning Signs in Bolero and their meanings.

Traditional	**Meaning**
Late rainfall-	Dry Spell to occur
Strange sound of a certain animal (Nkhululu)	Dry Spell is going to occur
Western winds	Dry Spell is going to occur
Army worms in the hills *(nthowo)*	Dry Spell is going to occur
Dark moon	Dry Spell is going to occur
Red moon	Rain is about to come
A black bird (Kowera) laying eggs in the hills	It is a sign of dry spell
When the plants in hills are still dry during growing season	Dry spell is going to occur
Leaves in *nsangu* tree during rainy season	Dry spell is going to occur
Vitondo trees bearing flowers	Sign of good rains
Dry vegetation n mountains	Sign of Dry spells
Absence of lightening	Is a sign of dry spells
When there is less hit	Sign of Dry Spell
When the sun is circled l	Rain is about to come
Wet mountains in the morning	is a sign of rain while absence might be a sign of dry spell
Sound of a certain animal (*chalira*)	Dry spell is to occur
less and occasional rains	Sign of dry spells

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Cold weather, winds	Sign of dry spells
Black Birr *"Khwangwala"* not hatching	Sign of rains

Use of Early Warning Systems

On the use of the Early warning Systems, out of the six villages that have scientific early warning systems knowledge, only two confirmed that they are using these scientific early warning systems. On Traditional Early Warning systems, all the communities accepted that they all use traditional knowledge in predicting the occurrence of dry spells but there are no systems in place neither are there communication structures. The communication structures are only present in the two villages where Action AID is working. However, the elderly expressed that due to changes in climate, the occurrence or behaviours of some early warning signs have changed as well. For example, they would predict that there would be rains upon hearing a certain sound of an animal but however, the rain does not come (*"waliyose wakuchita uo waonera tikuphalirana cha kuti vila vikung'anamura chilangalanga chifukwa tikuopa kuzyowa batesi para vyatondeka").* This has therefore made the communities not to trust the accuracy of Traditional early warning systems.

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Support from government and or other stakeholders.

On support, 8 villages said they are not supported in any way by either government or non-Governmental Organisations while one village stated that the government of Malawi through the ministry of Agriculture, helps the communities in preparing for dry spells however it does not necessarily touch on ways of predicting the occurrence of dry spell as this belongs to another government department (Disaster Department). On the other had two villages stated that the scientific and traditional early warning systems are supported by Action AID and

two other villages stated that they are supported by both Action AID in collaboration with Department of Disaster Affairs in Malawi (DODMA) through a project called ready for change. On documentation and utilisation of procedures of using these early warning systems, there was no documentation in eleven villages except in two GVHs where Action Aid is implementing its project with DODMA.

All the chiefs accepted that there are indeed traditional early warning systems but however, they expressed a concern that there is no deliberate action to ensure community use of the early warning systems because they are not supported by the government. Among the fifteen chiefs, five stated that they are currently encouraging the documentation and use of these traditional early warning systems with support from Action Aid and the government through the Department of Disaster Affairs in Malawi. The general remarks were that government recognises the existence of the traditional early warning systems but there has not been proof of accuracy of these traditional early warning systems hence it is a challenge to officially encourage people to use the traditional early warning systems in case they sometimes mislead the whole community. However, with support from Action Aid, the government managed to conduct research in two GVHs and they are currently encouraging the use of early warning systems in these areas.

DISCUSSION OF THE FINDINGS

General information about disasters.

Common disasters in Bolero

As outlined in the findings, the most common disasters in Bolero are Dry Spells, Strong winds, floods, pests and diseases and persistent rainfall. The disasters in Bolero are not far

from the most common disasters worldwide and in Malawi as a country. Red Crescent 2011 report states that the most common disasters in Africa are droughts in the horn of Africa, in such a case that Somalia is mostly affected by veritable famine. Bolero as indicated in the findings is mostly affected by dry spells. The International Strategy for Disaster Reduction (2008) predicts that drought will continue to be the major concern for African communities because of climate change. In Malawi, between 1967 and 2003, the country experienced 6 major droughts affecting over 21 million people in total and in 1994 and 1995 season, the drought caused a very high reduction in cereal production.

Apart from droughts, many countries in Africa are affected by floods for example Congo, northern Angola, and Mozambique (Red Crescent report 2011). Lukamba (2009), states that hydrolometeorogical hazards such as floods, drought, windstorms, wildfire and tropical psychlones, have accounted for loss of life wind spread damage and economic loss and in 2000 and 2001, almost 35 million people were affected by these disasters. Ferris and Petz (2012) also state that natural disasters also have an effect on rich people. These include earthquakes in Haiti, floods in Australia and drought in Texas. Floods affect Malawi especially in the lower shire river valley, and the lakeshore areas of Lake Malawi, Lake Malombe and Lake Chirwa. From 1963 to 2003, 18 floods were recorded as killing 570 people rendering 132,000 homeless and affecting a total of 1.8 million people.

People's perception of dry spells

Southern Africa Environment Outlook (2004 states that people have their different ways of understanding droughts. As talked by Saarinen (1976), social perception is concerned with the effects of social and cultural factors on cognitive structuring of our physical, structure environment. In Bolero, people gave different explanations on how they understand or

perceive droughts and dry spells. As outlined in the findings, the respondents described them as a season of less or no rains. Others described them as rain that comes for a short period of time, persistent sunrise, and absence of rains for 3 consecutive months. Malawi Vulnerability Assessment report (2013) states that when the rainfall deficiency is more than 10% and when 20 to 40 % of the country is under drought then the year is known as drought year. When the rainfall deficiency is more than 10 percent and when the spatial coverage of drought is more than 40 percent it is called India severe drought year. Mathugama (2013) defines dry spells as absence of rain for 7 or more dry days per year. Chabvunguma, Mawenda and Kambauwa (2003) stated that drought is said to occur in the country when seasonal rainfall is lower than 75 % of the normal. Dry spells turn into droughts last for3 to four months. Term glossary (2006) defines dry spells as the absence of rainfall for more than seven days. Pena and Douglas, 2002 define dry spells as days when 35 percent or less of stations reported rainfall. And wet spells are classified as when the stations receive 75 percent or more rains.

According to Chamvunguma *e t al* (2008), states that drought has negative effects on sectors such as water, health and fisheries but the most vulnerable sector is agriculture Mkanda *et al* 1995: Malawi Government , 2006).. The drought of 2001, /02 affected 2,829435 people (World Bank, 2010) and maize production alone was approximately 30 percent short of the estimated amount (Chamvungama 2008). The 2004/05 drought plunged the country into one of the most food security crises 84 percent of the population needed emergency food assistance and a total of 5,100,000 people mostly farmers, women and children were affected as a result of crop failure, insufficient water supply and malnutrition. In terms of area coverage, 11 out of 21 rural Development project areas were affected (World Bank). Rich countries are also affected by disasters. Feris and Petz (2012) state that in rich countries especially in 2011, natural disasters had great effects on livelihood. The earthquake in japan

alone made up to 55 percent of the global damage in 2011. According to Munich Re, New Zealand earthquake caused a damage of more than fifteen billion dollars. The problem in Bolero still persists such that the Malawi vulnerability assessment report still shows that Rumphi households have been affected by hunger in 2015. The 2014-2015 Malawi Vulnerability Assessment report predicts that While the country has registered a surplus during the 2013/14 growing season, there will be problems of food insecurity at household level in nineteen districts and Karonga, Mzimba and Rumphi in the Northern Region. Parts of these districts experienced a combination of late on set of rains, early cessation of rains, erratic rainfall, prolonged dry spells and flooding. Localised weather hazards reduced crop production in isolated areas of 19 districts namely: Karonga, Mzimba and Rumphi in the Northern Region; Dedza, Dowa, Lilongwe, Mchinji, Ntcheu and Salima in the Central Region and Balaka, Blantyre, Chikhwawa, Phalombe, Machinga, Mulanje, Mwanza, Neno, Nsanje and Zomba in the Southern Region (Malawi Vulnerability Assessment Committee report 2014). This report is in relation to the recurrent effects of dry spells which the people of Bolero expressed.

Mathugama (2013), states that "the unpredictable pattern of dry spells cause significant damages to the agricultural system, livelihood of the people and economy of the country. Government in Malawi and other supporting institutions have put some measures to alleviate drought impacts and these are the World Bank Index based weather insurance scheme to provide compensation to farmers (Syroka *et al* 2010), green belt and conservation agriculture. The activities which people are involved in Bolero includes; tree planting, early planting and early cultivation and growing of early maturing varieties.

Existence of Traditional Early Warning Systems.

The respondents in Bolero stated late rainfall, strange sound of an insect *"Nkhululu"*, outbreak of insects in the hills *"Nthowo"*, western winds, black bird laying eggs in hills, leaves in *Nsangu* tree and *vitondo* tree, absence of lightening, western winds, circled sun, red moon, black bird *"Khwangwala"* not hatching are all signs of dry spells while dark moon, heat, wet mountains in the morning are signs of rains. Some of these traditional early warnings systems are similar to those used in Ghana. According to Toomey *Et al* (2011), the early warning signs used in Ghana are Dropping of fruits before maturity indicates very dry season or drought must be expected Occurrence of army worms is an indication of drought to come Immature fruits drying on trees and/or dropping from the trees is an indication of drought and mist covering hills and mountains is a sign of good rains. PAS Report (2005) also confirms the use of insects and plans in predicting changes in climate. For example, in Ghana, a Flog croaking in dry season means that rainy season is imminent. Secondly, when *Onyina tree (Ceiba pentandra) starts gaining leaves after it has shed its leaves from December to March, then it is an indication that the rainy season is near.*

Use of Early Warning Systems

Rather, Patt and Gwata (2006) wrote that making forecasts useful to decision-makers, especially subsistence farmers in developing countries, remained a significant challenge. They discussed a set of six constraints limiting the usefulness of forecasts: credibility, legitimacy, scale, cognitive capacity, procedural and institutional barriers, and available choices. In Bolero, despite availability of traditional early warning systems, there are some challenges faced aswel especially in the use of these early warning systems. Out of the six villages that have scientific early warning systems knowledge, only two confirmed that they are using these scientific early warning systems. On Traditional Early Warning systems, all the communities accepted that they all use traditional knowledge in predicting the occurrence

of dry spells but there are no mechanisms in place to ensure that these are properly used. On the other hand, the elderly expressed that due to changes in climate, the occurrence or behaviours of some signs have changed aswel. For example, they would predict that there would rains upon hearing a certain sound of an animal but however, the rain does not come. This has therefore made the communities not to trust the accuracy of Traditional early warning systems. In addition, they also stated that the knowledge of these early warning systems is now diluted since most of the elderly passed away and there was no documentation of these early warning systems. Makwara (2003) states that the disadvantage with our indigenous knowledge is that it is resident only in the head of the beholder. Unfortunately when they die, they die with their knowledge. In the absence of documentation of this knowledge, the surviving generations can only misquote and misinterpret it. According to the second Africa Environment Outlook (AEO-2), traditional knowledge has been overlooked in the past and, in some cases, is actually being lost. And as Williams and Muchena (1991) observed, the skills to identify, collect, and develop indigenous knowledge into contemporary usable formats are needed so as to ensure the sustainability of this knowledge. Without that, our focus on the promotion of marrying local knowledge and modern science for sustainable agriculture will be futile (Makwara 2003).

Support from government and or other stakeholders.

Lukamba (2009) states that every government needs to have strong political governance and this entails that governments should employ a skilled administrator on DRM in all levels; development of a national mechanism and local community participation in intervention. Internalisation of the responsibility and specialist capabilities where DRR should become a ministerial function rather than simply a minor department as they exist in most African nations. In Bolero this is not the case; the area faces challenges in coordination with the

Disaster Risk Reduction Office. As outlined in the findings, 8 villages said they are not supported in any way by either government or non-Governmental Organisations while one village stated that the government of Malawi through the ministry of Agriculture, helps the communities in preparing for dry spells however it does not necessarily touch on ways of predicting the occurrence of dry spell as this belongs to another government department (Disaster Department).

ISDR Report (2003) states that in South Africa, even if there are disaster management officials appointed in the local governance structures, a general perception of the need for DRR activities is not always prevalent nor is the funding to undertake such activities. As a result officers turn their attention to other matters. This is also the case in Bolero where there is shortage of Disaster officers and these are not deployed to village levels in a sense that there is only one officer at the district and regardless of the availability of Civil Protection committees in the villages, they are not adequately trained and hence early warning systems are successful in the areas where action AID is available because of availability of funding for officers and trainings aswel. In addition, despite of the efforts of the government to deploy some people in Disaster Risk Reduction, there is no straight policy to emphasise the importance of taking into consideration of the local knowledge in climate change adaptation. There is also currently no Disaster Risk Reduction Policy and the Climate change policy does not provide for that.

Chiefs in Bolero expressed a concern that there is no deliberate action to ensure community use of the early warning systems because they are not supported by the government. Among the fifteen chiefs, five stated that they are currently encouraging the documentation and use of these traditional early warning systems with support from Action Aid and the government

through the Department of Disaster Affairs in Malawi. The general remarks were that government recognises the existence of the traditional early warning systems but there has not been proof of accuracy of these traditional early warning systems hence it is a challenge to officially encourage people to use the traditional early warning systems in case they sometimes mislead the whole community. However, with support from Action Aid, the government managed to conduct research in two GVHs and they are currently encouraging the use of early warning systems in these areas. Netskuwi *et al* (2013) the need for building the capacity of both leaders and practitioners to work with the interior dimensions of adaptation is becoming increasingly evident. Relating climate change adaptation to the needs, goals, motivations, and aspirations of different individuals and groups requires leaders that can take multiple perspectives, and skilled practitioners that have an understanding of human development as well as environmental change processes (Netskuwi *et al* 2013).

Traditional knowledge is vital in predicting changes in climate. However, the use and application of Traditional Knowledge as early warning systems in climate change is undervalued by policy makers hence its application in the communities is not supported with real structures. Rincoli *et al* states that "The knowledge of the indigenous people should be included when designing adaptations to climate change especially in Africa. Local communities and farmers have developed a rich knowledge base of predicting climatic and weather events based on observations of animals, plants, and celestial bodies, among others demonstrated that indigenous knowledge on rainfall forecasting can form an important part of the scientific forecasts in Burkina Faso. It was urged that understanding how local communities perceive and predict rainfall variability is key to communicating scientific weather forecasts.

CONCLUSION AND RECOMMENDATIONS

In conclusion, there are traditional early warning systems in bolero which help in predicting the coming in of not only dry spells but other disasters which this research did not focus on. . However, some of the traditional early warning systems are not very accurate in predicting dry spells but most of them are reliable. Despite that there are scientific early warning systems in some places in Malawi, the research discovered that out of the five sampled Group Village Headmen, and only one GVH had structures in the community that deal with disasters aswel. These structures have both information on traditional and scientific early warning systems. It is therefore recommended to the government to recognise the traditional early warning systems in Bolero and ensure that they are being supported by the government through incorporation of the traditional early warning systems into scientific early warning systems integration of traditional knowledge in scientific early warning systems is a great step towards transformation of community adaptive capacity to climate change.

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