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Climate Change Adaptation in Ward 13 of Gokwe North District – Zimbabwe: 2017-2021

Majoma Albert[1] & Mushaka Charles[2]
[1]Ministry of Lands, Harare, Zimbabwe
[2]Department of Development Studies, Zimbabwe Open University, Midlands Campus, Zimbabwe

Abstract

The study focused on climate change adaptation. The study was carried out in ward 13 of Gokwe North District. The open ended questionnaire and face to face interviews are the research instruments which were utilized for data generation. The researchers distributed 20 questionnaires which were all returned after filling in. The researchers interviewed 9 individuals which have experience and expertise in climate change in their field of work. Deforestation was mentioned as the major cause of climate change among other causes in the ward. A number of causes were mentioned but the majority respondents or participants mentioned deforestation. Several sources of information on climate change were highlighted in the study. There are as follows: pamphlets, text books, internet, Civil Protection Unit, Zimbabwe Broadcasting Corporation and farmers among others. Adaptation methods to climate change issues were cited in the study to be available in the ward and indigenous knowledge systems were also available to deal with climate change adaptation. Continuous education and awareness campaigns were shown to be necessary in climate change adaptation. The study recommended that communities be settled away from flood plains. It was also recommended that the government through its departments need to capacitate communities on climate change without causing further damage to the environment.

Key words

Climate change, adaptation, gokwe north

Background of the study

Global climate change is viewed as a serious issue by the government of Zimbabwe. The government signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 at the Rio earth summit and ratified it in November of the same year. The driving forces behind this concern stem not so much from problems of reducing Zimbabwe's emission of greenhouse gases (GHG),but rather the potentially serious that global climate change issues in the 1996 review of environmental legislation(https://www.adaptation-undp.org). Zimbabwe intends to incorporate climate change policies in its national development plans.

Zimbabwe like the rest of Africa is constrained by its inability to put appropriate measures in place in order to respond to climate change requirements because of the lack of human, institutional and financial resources. Climate change impacts in Zimbabwe are related to water supply and food security (https://www.adaptation-undp.org). The country is already prone to droughts, which have become more recurrent over the last two decades.

The geographical location of Zimbabwe in the tropics makes it vulnerable to shifting rainfall patterns and water resources availability (Chakwana 2013). Zimbabwe is also vulnerable to climate driven health impacts from vector borne diseases such as malaria worsened by the Hiv/Aids pandemic. Adaptation measures to address climate change impacts are required to reduce impact in key economic sectors, especially agriculture (https://www.adaptation-undp.org).

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While Zimbabwe's contribution to global emissions of GHG is very small, there is growing concern over the potential impacts of climate change on the country in the future. Given the heavy dependence of the country on rain-fed agriculture, absence of natural lakes, frequent occurrence of droughts in the region and a growing population, the potential social and economic impacts from climate change could be devastating (https://www.adaptation-undp.org).

Climate change is projected to have profound impacts on Zimbabwe including heightened water stress, increased incidence of drought, declines in crop and livestock productivity, changes in wildlife ranges, an increase in wildfire incidences and the possible expansion of malaria zones (Chakwana 2013).

Mainstreaming climate change means incorporating climate risks into all development decisions and development planning. When climate risk is explicitly considered and incorporated intopolicies, plans and practice, development efforts are more resilient to climate uncertainty and more likely to reach their objectives (https://www.adaptation-undp.org Zimbabwe has abundant natural resources, including minerals, agricultural and, water, natural vegetation and wildlife. The population in both urban and rural areas depends heavily on ecosystem services that provide a clean, regular water supply, fertile soils and trees for fuel, building construction and fencing. In addition many rural Zimbabweans draw on important food sources in the form of wild foods during times when agricultural produce is out of season. These vital resources and services have been degraded over the years through various human activities. Climate change will accelerate the degradation and its impacts will be felt more strongly. Zimbabwe's soils, for example have been increasingly eroded through annual ploughing, burning for land clearing, deforestation and poor grazing management. Lack of control of water runoff on slopes and uncontrolled open cast mining in some areas have added to the degradation. Deforestation has become a major problem in recent years as forests have been cleared in preparation for agriculture, fencing and for use as firewood mainly for tobacco curing and brick moulding.

This study was guided by the following research questios; what are the causes of hunger in ward 13 of Gokwe North District?; What are the control measures of hunger in ward 13 of Gokwe North District?; and what possible mechanisms that can be adopted by Gokwe North District?

Climate change impacts

Climate change impacts are described with increasing confidence by IPCC (2007).The impacts might be direct, for example, changes in agricultural potential caused by rainfall change. Climate change involves not only global warming but also other physical changes such as precipitation, the intensity and frequency of storms and the occurrence of droughts and floods. The global density driven circulation of the oceans which would amplify climate change are considered as two of the main irreversible risks associated with climate change. They might be indirect, for example, through effects of climate change on world market prices of agricultural and fisheries products.

The need for adaptation is inevitable no matter how efficiently we manage to reduce the growth in emissions (Yohe 2000).Measures cover a correspondingly broad range from direct interventions such as dike building to prevent flooding, large scale relocation of farmers, new crop selection and building of dams to expand irrigation, to capacity development in public administration, civil society and research. There are concerns within the agricultural sector and it is believed that adaptation in developed countries with temperate climates will not only reduce vulnerability but be able to realize opportunities and production (Smit and Skinner 2002).

In developing countries climate variability and change will enhance heat and moisture stresses and contribute to a long list of existing problems. Temperatures have already increased by an estimated 0.7

degrees celcious compared with pre-industrial levels. There is still some controversy on the contribution of anthropogenic GHG emissions to temperature increases. However the last report of the Intergovernmental Panel on Climate Change (IPCC 2007) attributes most of the observed increase in global average temperatures since the mid 20s to anthropogenic causes with a probability of more than 90%.Furthermore this report also identifies a range of already observed impacts of climate change.

Climate change is likely to have consequences in many areas of human activity. Some of the consequences are already being observed. Consequences are often classified in two broad categories depending on whether they directly affect the economy such as for instance agriculture production and energy consumption called market impacts. They broadly affect humans and society (health and environment) and are called non market impacts (Downing etal 2005).

While some of the impacts can be positive both to the economy and society at least for moderate increases in temperature most are expected to be negative. Furthermore the severity of the impacts is likely to be nonlinear at higher temperatures. This is because when some threshold temperature increases are crossed the probability to experience large damages on the economy and ecosystem becomes higher (Keller et al 2006).Although there are still large uncertainties concerning the understanding of these thresholds empirical evidence tends to suggest that such threshold effects may be significant (Schneider and Lane 2004).According to recent studies an increase in temperature by 1.5 degrees celcious relative to preindustrial levels would initiate the melting of the Greenland ice sheet that could lead to a 7 meter sea level rise. A larger increase would lead to the disintegration of the west Antarctic ice sheet and an additional 5metre sea level rise. The weakening of the thermohaline circulation is expected at low increase in temperature but there are large uncertainties regarding the threshold that would trigger its collapse including for instance the disappearance of the Gulf Stream.

Estimating the economic impacts of climate change raises a number of difficult issues. First the knowledge on the physical impacts of climate in every possible area is limited. Aggregating specific impacts into a single estimate of the net impact of climate change also raises a number of problems. These mainly arise because impacts have to be aggregated along three dimensions. These are cross impacts which require the use of a common measure for market and nonmarket impacts. The cross regions raises an equity issue and overtime which implies the use of a social discount rate (Schneider and Lane 2004).

A relatively large number of studies have attempted to estimate the impacts of climate change in specific areas using methodologies. The typical approach of early studies consists in combining a climate model that projects climate change for given level of carbon dioxide concentration. These studies estimate static and physical impacts of climate change on today’s world mainly for modest increases in temperatures and cover a limited number of regions (Tol 2002).

One of the most important impacts expected from climate change is to deteriorate health. Its size may be understated since estimates are largely incomplete. The number of additional deaths coming from an increase in temperatures has been estimated only for specific diseases, for example malaria. Furthermore the indirect consequences of climate change on health through food availability, water constraints, air quality or conflicts induced by climate change are mainly unknown.

Climate change can lead to significant rise in sea level and catastrophic events with implications on migration and the capital stock. Part of these impacts can be avoided through adaptation policies. It is expected to damage infrastructure but this effect can also be partly offset by adaptation strategies. Climate change would also have a negative impact on biodervisty and the ecosystem although these effects are still partly unknown (Tol 2005).

The sign of the impact of climate change on agriculture is uncertain at least for moderate increases in

temperatures. Main difficulties to estimate this impact come from our limited knowledge of the impact of climate change on precipitation. Furthermore there are also debates on whether carbon dioxide fertilization occurs. The increase in carbon dioxide concentration in the atmosphere enhances photosynthesis rates thereby allowing stronger growth of plants and more effective carbon fixation. This has the potential to mitigate or even to offset the negative impact of climate change in the agriculture and forestry sector (Reilly 2007).Finally adaptation can also mitigate the impact of climate change in this sector.

Estimates suggest that climate change would lower gross agricultural production where no adaptation is assumed in most countries but that adaptation could offset this negative impact. A large part of the impacts of climate change are measured in physical units such and number of annual deaths, number of people threatened by forced migration and the species lost. It is important to note that more recent studies consider socio economic development in parallel with climate change and this could be expected to limit damages in this area as development will lower vulnerability to climate change, for example by increased provision and access to health services(Tol 2005).

Reilly et al, (2007) find that climate change below 3 degrees celcious relative to 2000 levels would have a positive effect on agriculture production because of this effect. Beyond the regional interactions with soil conditions above temperature increases of more than 3 degrees celcious relative to 2000 levels fertilization effects are expected to be offset by heat stress effects (Ainsworth and Long 2006).

Once impacts are expressed in a common monetary unity their estimated distribution across areas including market and non market impacts varies strongly across countries. For instance larger impacts are expected on agriculture in middle income countries and on health in Africa.

There are larger variations in the size of impacts across countries with developed countries being in general less affected than developing ones. These variations make the issue of aggregating impacts across countries or regions particularly important and politically sensitive as aggregation conceals distributional issues. The simple sum of regional impacts is useful for discussion of the global effect of climate change. However it ignores the disparity between regions in terms of impacts and because the value attributed to non market impacts generally decreases with income. A simple sum implicitly puts less weight on impacts in poor countries than in richer ones. To take these factors into account the choice of an appropriate social welfare function plays a crucial role.

The way impacts are aggregated across countries influences the preponderance of one impact over the others at a global level and more generally the distribution of global impacts within sectors. This is because regions are not equally exposed to each type of impact. For instance climate change is expected to have a large impact on health in developing countries and large market impacts in developed countries. As a result when impacts by countries are weighed by population which gives more weight to impacts in non-OECD countries. Global impacts appear to be mainly driven by non market impacts while they appear to be mainly driven by market when impacts by countries are weighed by income.

Most of the impacts of climate change are expected to occur in the long run the social discount rate (SDR). It measures the importance of the welfare of future generations relative to the present strongly shapes the global impact estimate of climate change. There is a widespread and longstanding disagreement among economists about the appropriate level of the SDR (Weitzman 2001).

The impact of climate change is dynamic in so far as it would depend on the path of GHG emissions and thus on population growth, economic growth and technological change. Integrated

assessment models (IAM) try to capture the whole process of human induced climate change from economic growth to emissions and their consequences on the physical climate. However these models currently have

several limitations. They suffer from uncertainties surrounding estimates of physical impacts and from the difficulty to aggregate impacts across areas, regions and time. They have to adopt a very rough representation of the impact of climate change. Thirdly the response functions and the optimal emission paths are derived assuming that impacts are certain.

On the whole estimates of the global impact of climate change have not changed much over the last 10 years according to the IPCC. However the Stern review estimates are much larger than in other studies. This is mainly due to a discount rate and to a lesser extent to new information regarding the impacts (Dasgupta 2007).Nevertheless use of a low discount rate may involuntarily yield more plausible estimates than those in the rest of literature (Weitzman 2007). The vulnerability of the agricultural sector in many developing countries is caused by poverty and limited economic capacities (Barbier et al 2009).The current socioeconomic and technological drivers in agriculture have hitherto rendered climate change another stressor of the system.

Climate change adaptation policies

Policies on adaptation to climate change must be very carefully devised as they find themselves in a complex reality of societies that are poor and vulnerable for a wide range of reasons. They must be an integral part of a development policy process that ensures mainstreaming of climate adaptation in all relevant sectors of society while not forgetting the other multiple drivers, that is, social, economic, and environmental problems. The policies at the national level should be specific investments in physical and institutional assets that reduce climatic vulnerability and increase coping ranges without causing counterproductive effects (Thomas and Twyman 2005).

Examples of physical assets can be stronger infrastructure related to transport, energy, and water supply as well as new options for agricultural techniques. Institutional assets can be information systems, financial and risk sharing systems, insurance, education and warning systems that directly or indirectly or indirectly address local, national or regional vulnerability to climate change and variability.

Climate vulnerability, adaptation, and the current development policies

Climate variability is already creating serious impacts on major poverty alleviation goals in developing countries. The linkages between climate vulnerabilities and development policies are increasingly being addressed as well as international climate policy debates and in development assistance. Climate change mainstreaming issues related to vulnerability and adaptation were put on the agenda at the conference of the parties (COP)7 in Morocco in 2001.It was decided that special support should be given to a group of least developed countries (LDC s).

Community adaptive capacity

Adaptive capacity can also be considered at the scale of communities, sectors and regions. Some insight into the adaptive capacity of larger social systems can be derived from knowledge of the adaptive capacity of individuals that make up a community. Direct assessment of community level characteristics can provide information that is both more efficient and more accurate about the likely response of communities to climate change. Community level data provides an important opportunity to cross-check and contextualize conclusions based on individual level data.

Individuals, industries, communities and governments need access and opportunities to learn about the impacts they are having on natural resources (Cinner etal 2009). Without an understanding of the connection between human activities and resource condition people are likely to support management initiatives that restrict resource use. Cinner et al (2009) found out that in Madagascar feedback of ecological monitoring

was not effectively reaching the communities such that the potential to adaptively modify regulations based on new information was not being realized.

The capacity to reorganize is important in order to effectively respond to disturbances and in order to plan for the disturbance as in the case of climate change. Communities that have a higher capacity to reorganize tend t draw upon a wide range of resources both within and outside of the community and have a high degree of participation in community decision making (Cinner 2009).

Assets or constraints within a community are human capital, physical capital, social capital, financial capital and natural capital. Examples of human capital are education, skills and health of household members. Physical capital may include farm equipment or a sewing machine. Social capital is the social networks and associations to which people belong. Financial capital and its substitutes include savings, credit, and cattle. Lastly natural capital is the natural resource base. The balance between the five capitals is as important as the amount of any one type of capital can complement and substitute for each other in the process of generating livelihoods (Ellis 2000).

Communities with higher stocks of capital or more diverse livelihoods are more likely to be able to absorb the costs of climate adaptation (Nelson et al 2007).A stable and prosperous economy is more likely to encourage individuals to consider a different range of adaptation options to individuals living with instability. Developed and wealthy nations are better prepared to bear the costs of adaptation than developing countries (Osbar and Viner 2006).Governments with clearly delineated 16 roles and responsibilities for implementation of adaptation strategies will be better prepared to cope with and adapt to climate change (Walker et al 2009).Nations and communities with access to climate technology, expertise and information and with for the discussion of adaptation strategies are more likely to be better prepared for climate change (Burton 1996).Openness to development and adoption of new technologies is also believed to be important for strengthening adaptive capacity.

Communities need cultural, political, institutional and economic flexibility if they are to maximize the conditions necessary for experimentation and effectively respond to change (Berkes and Sexias 2006). In some regions customary taboos can be relatively inflexible. However co management initiatives have successful under some conditions (Cinner etal 2009).The extent to which other livelihood opportunities exist within a community is an important measure of flexibility. Communities with a greater number of livelihood options are likely to be less sensitive to climate changes since they are more flexible.

In many rural regions gender equity and roles may be important for influencing climate adaptation. Men and women have different assets, access to resources and opportunities such as education and involvement in community decisions (Ellis 1999).In general women are often trapped in customary roles. Yet recent research in farming districts of developed countries has shown that men have an average of 2-3 identities and women have an average of 4-5 identities usually reflecting community roles. Women may be able to switch between their identities more easily and this may be important especially during stressful or adverse life events. Women may be able to support a vital and formal role within communities during the adaptation process especially where transformative change will be necessary.

Resource users can possess low adaptive capacity as a result of social norms or due to how environmental institutions operate (Allison and Hobbs 2004).Changes can be introduced too rapidly or too frequently where impacts become observable. The ways in which policy changes are perceived can accelerate the rate at which thresholds of coping are reached and erode the resilience of resource dependent people (Wingard 2000).

Social institutions and arrangements governing the allocation of power and access to resources within a nation, region or community that ensure access to resources is equitably distributed can be better able to

cope with climate related changes (Mustafa 1998).The presence of power differentials can contribute to reduced adaptive capacity through preventing confidence in the future inhibiting involvement in the creative and experimental design of adaptation plans and eroding trust.

Lack of trusting relationship with decision makers planning for climate adaptation can increase the efficiency with which goals can be reached (Torsvik 2000).Many researchers have found that feelings of unfairness and unjustness are sentiments that are especially typical of small-scale, traditional and displaced resource users with untransferable skills (Cochrane 2000).These people have also been shown to be the most likely to bear the costs of new policies (Nord 1994).

Involvement in the decision making process increases the likelihood that communities will trust the motivation behind new policies and understand their rationale and intended outcomes. Governance systems that actively involve community members in the decision making process and are flexible and open are believed to assist in the maintenance of social resilience (Carpenter and Gunderson 2001).By increasing equality in the decision making process the adaptive capacity of resource users can be enhanced since the system can better experiment and learn from different strategies and incorporation new information into the design of new strategies.

Corruption and a culture of political patronage may significantly reduce the capacity of a society to absorb and adopt to change by directly influencing many of the factors. For example corruption frequently contributes to unequal resource access and disenfranchisement. It also leads to weakened institutions and legislation rendering them inefficient or irrelevant because decision making is driven in the interest of the few and privileged rather than of the common good. The ability of the individual to cope with change is thus reduced. Options are more limited and access to knowledge, services and support is more restricted. The greater the extent to which this influences a society or community whether in terms of number of people disenfranchised or financial loss to society the greater the effect on vulnerability and resilience (Eriksen etal 2007).

Markets sustain all but subsistence livelihoods but are fickle. Market fluctuations are usually beyond the control of those that supply them especially among poor communities. While highly specialized monoculture may for a time be efficient it is also vulnerable to market place. This is increasingly so in the case of climate change sensitive natural resource based economies. A multiplicity of livelihoods strategies may thus reduce risk and safe guard against economic hardship in the long term. Carefully assessing the diversity and vulnerability of markets and livelihood strategies is thus essential to support adaptation planning.

Building social resilience

Understanding vulnerability is an important first step in minimizing the impacts of climate change on social systems. While adaptation is clearly in the interests of those most vulnerable it is often policy makers and resource managers who are best positioned to facilitate development and implementation of vulnerability strategies. The sustainable livelihoods enhancement and diversification (SLED) approach focuses on livelihood assets and is a participatory process of discovery, direction finding and implementing. SLED helps community members identify underutilized assets and livelihood options and develop sustainable locally appropriate income generating activities. This approach is particularly valuable where livelihood activities are vulnerable to change whether as a result of policy interventions and climate change. New options must be developed in locally accessible and sustainable ways (www.iucn.org/marine).

The community based risk screening tool is a planning and management tool designed to help project assess the impacts of a project on the climate vulnerability of beneficiaries and adjust activities to improve their impacts on climate change resilience. It uses a holistic view of the local of the climate and livelihood

context to generate information that supports an assessment of the impacts of particular interventions (www.cristal-tool.org).

Vulnerability assessments and resilience analyses will reveal the need for a large range of strategies to enhance regional resilience. However the sources of vulnerability exceed in number and size the resources available for resilience building. A necessary step towards implementation of effective strategies therefore is prioritization of resilience building efforts. The preparation of national adaptation plans of action (NAPAs) for developed countries is one mechanism through which this has been attempted. Enhancing regional resilience can sometimes come at the expense of resilience of some communities or individuals.

Individuals, communities and sectors will vary in the extent and immediacy of their vulnerability to climate change. People with the greatest vulnerability in the short term are likely to warrant priority in allocation of adaptation resources (Tschakert 2007).In some cases highly vulnerable individuals or groups may face great hardship or forced transformation if they do not receive adaptation assistance. A challenge is to evaluate need in ways that enable managers and adaptation practioners to rank candidates for adaptation in a way that provides a transparent and defensible basis for decisions about allocation of adaptation resources (Fussel 2007).Decision makers should establish clear criteria for evaluating need and for recognizing when adaptation assistance is particularly urgent.

Adaptation strategies will vary in the benefit they deliver. For any one group of people some strategies can be expected to result in larger reductions in vulnerability than others and should be appropriately prioritized. Benefit can also assist with triage decisions about what sectors or regions to invest adaptation resources in. Some sectors or regions will respond more actively to adaptation efforts delivering larger or more sustainable adaptation benefits for a particular investment (Daily etal 2000).

Adaptation strategies can be effective in theory but infeasible in practice. Ideas for reducing vulnerability might be economically challenging such as politically difficult to protect opportunities. The feasibility of strategies might also be limited by the capacity of individuals or groups to comprehend or prepare for predicted changes. Whilst there is often scope to increase the feasibility of potentially good adaptation ideas. A feasibility analysis will help identify strategies that are immediately more practicable. In instances where feasibility is difficult to evaluate a risk based approach can help with decision making in face of this uncertainty.

Adaptation options will vary directly in the amount of resources required for their implementation. Weighing up costs against feasibility and likely benefits is very informative to resource allocation decisions. Inexpensive options may deliver major benefits with great uncertainty. At the other end of the spectrum of appeal are expensive options that are difficult to implement and likely to deliver only minor benefits. Costs can be measured in financial, social or political terms. Decision makers should consider the nature of the vulnerability, the type of adaptation strategy and the institutional context of the adaptation initiative.

Once priorities areas have been identified strategies will need to be identified that best meet the goals of the adaptation plan. Developing suitable strategies for enhancing social resilience is best done in participation with those likely to benefit. This is because they will be in the best situation to identify strategies that are most feasible, attractive and acceptable. Many research studies have shown that meaningful involvement in the decision making process is essential to foster feelings of satisfaction, understanding, trust and confidence in the future. These feelings are necessary for a successful transition to adapting to change and in particular policy change (Marshall 2007).

Kallstrom and Ljung (2001) convincingly argue that people must be satisfied with their situation in terms of control over decisions in order for social sustainability and environmental goals to be achieved. They believe that by participating in decisions regarding the future and by taking part in the public debate, day to

day life becomes more meaningful and social identities are strengthened around the resource.

In contrast those that do not have the opportunity to be meaningfully involved in the process involved in the process tend to feel that policy changes are unfair, unnecessary or illegal where some people do well out of them and others do poorly (Marshall 2008).If people feel confident about their future and the future of the resources they are more likely to positively assess the risks associated with change and their ability to cope both of which are important in maintaining social resilience. There is need for knowledge and tools to develop climate adaptation strategies. However adaptation strategies cannot succeed if they stand alone or are pursued outside e4xisting institutions and frameworks. Infact the pervasive influence of climate change means that climate adaptation needs to be integral to nearly every aspect of planning and policy.

Development activities should be reviewed to ensure the implications of climate change. There are appropriately considered and strategies for minimizing climate impacts. Minimising stresses that can exacerbate the effects of climate change are integral to implementation. Natural resource management, planning and policy need to be reviewed in light of the additional challenges from climate change. Climate change is affecting the sustainability and predictability of the supply of goods and services. Climate change is also imposing stress on the social systems that depend on these goods and services. The welfare of resource dependent people will be increasingly vulnerable if they do not adapt to climate change. This vulnerability could be exacerbated by management decisions that restrict access to resources in the short term. The restrictions are designed to increase long term sustainability of ecosystem of goods and services. People struggling to maintain their quality of life are less likely to support efforts to build social resilience.

Planning and policy will need to adapt. Managers should be given the mandate to support adaptation of resource dependent people as an integral part of building resilience to climate change. Ultimately climate change adaptation will require that the need for investment in adaptation activities be reflected in national and local policies and budgets. Reviews of policy affecting natural resource management can be very helpful in identifying key policy gaps (Marshall and Schuttenberg 2006).

Climate change is a global challenge yet there is much that can be done at the local level to minimize impacts and capture opportunities. While every effort must be made to stabilize greenhouse gas concentrations before the climate systems passes thresholds that cause irreversible damage. We must also accelerate efforts to prepare for those changes that are inevitable. Adaptation to climate change will make a major difference to how hard the impacts of climate change are felt.

Sustainable livelihoods and climate change

Livelihoods approaches are based on the understanding that poverty and the ability to move out of poverty reflect the capabilities and assets available to those affected. This includes material assets such as access to land, other natural resources, financial capital and credit, tools and inputs into productive activities. It also reflects human capabilities, social, political factors to negotiate fair and adequate outcomes in the market chains within which people buy and sell goods and services (Stern 2006).

Sustainable livelihoods programmes typically assess the barriers that people face in improving their livelihoods and design programme interventions to overcome these. Some of these are not directly affected by climate change, for example people’s power to negotiate fair prices for products and services. However many are directly affected by climate change particularly those concerning the ability of producers to produce.

For example when rising temperatures increase crop water demand and weather is ever more unpredictable farmers struggle to know when to cultivate the land, sow, and harvest. Rainfall even within the rainy season is becoming concentrated into more heavy downpours punctuated by dry spells damaging crops. These types

of impacts are almost universal but they often have clear potential solutions. Strategies for implementing these solutions need to be rooted in an understanding of how people sustain their livelihoods and be implemented alongside the existing strategies that aim to overcome the barriers that prevent people from improving their livelihoods (UNDP 2007).

Natural resource management and climate change

Climate change makes the wise management of natural resources, that is, water, soils and trees. This is even more important as a way of supporting communities to adapt to climate change. This is because climate change increases resource scarcity. For example, in areas that are becoming drier and in coastal areas suffering from saline intrusion, there is a reduction in the availability of water for household and productive use. The role that natural resources play in buffering communities against extremes of climate becomes more important as climates become adverse. For example, increasing soil's organic content improves water retention and drainage that can help crops as rain becomes more concentrated into heavy downpours. Even when there is no change in the overall rainfall each year (UNDP 2007). Reforestation can reduce local temperatrures, provide additional income, protect against soil erosion, landslides, local flooding and provide food and fodder in times of scarcity.

Gender and climate change

While climate change affects everyone it is not gender neutral. It magnifies existing inequalities reinforcing the disparity between women and men in their vulnerability to climate change and their ability to cope with it. Women form the majority of the world's poor tend to be more vulnerable to the effects of climate change. There are being affected in their multiple roles as food producers, providers, and guardians of health, care givers and economic actors. They are more likely to become direct victims through death and injuries of climate related disasters such as hurricanes and flooding (WEDCO 2007). They are less likely able to swim and are more likely to be at home when such events occur. Drought, deforestation and erratic rainfall cause women to work harder to secure resources such as food, water, and fuel. Women have less time to earn an income, get an education or training, or participate in decision making processes. Families affected by poverty, and many of which are headed by females often live in more precarious situations ,for example, on low, flood prone lands or on steep slopes(UNDP 2007).

Statement of the research problem

Global climate change is viewed as a serious issue by the government of Zimbabwe. Zimbabwe intends to incorporate climate change policies in its national development plans. Zimbabwe like the rest of Africa is constrained by its inability to put appropriate measures in place in order to respond to climate change requirements because of the lack of human, institutional and financial resources. The country is already prone to droughts which have become more recurrent over the last two decades. The geographical location of Zimbabwe in the tropics makes it vulnerable to shifting rainfall patterns and other water resources availability. Adaptation measures to address climate change impacts are required to reduce impacts in key economic activities especially agriculture. There is heavy dependency of the country on rain fed agriculture, absence of natural lakes and frequent occurrence of droughts. The potential social and economic impacts from climate could be devastating. Therefore the researchers are going to identify effects of climate change and recommend solutions to the problems.

Methodology

The study utilized a case study design guided by interpretive philosophy. The case study research design informed the guiding basis for this study as the study was engrossed essentially on ward 13 in Gokwe North district. The data was generated until the saturation point. Key informants were purposively selected within

the district ranging from the Gokwe North Council, Local government department and heads of government departments within the districts. Some participants were conveniently selected from the wards understudy. Face to face interviews and open ended questionnairs were adopted for this study as data collection tools.

Findings

The researcher got responses from the 20 questionnaires distributed and returned.The age of a person influence the perception about climate change as well as knowledge on its effects. It is indicated that among the respondents there was no one below 18 years old. In the range 18-25 years 2(20 years) 10% was noted. While 10(50%) was recorded in the range 26-40 years.

Above 40 years it was recorded 8(40%) of the respondents who participated in filling the questionnaire. Reed (1999) argued that people working and living in resource dependent communities often have limited experience in other occupations and often lack transferrable skills and consequently become locked into their occupation. Allison and Hobbs (2004) highlighted that people that are older have little education and are uninterested in working elsewhere. However the above statement disagree with the research finding since according to this research 40% of the respondents were above 40 years older but they have knowledge on climate change adaptation.

The study shows that 14(70%) of the respondents were married, 3(15%) divorced, 2(10%) widowed and 1(5%) was not married. However marital status influences an individual's perception and knowledge as far as the effects of climate change is concerned. Those not married do not need to consult before seeking information on climate change than those who are married. Ellis (1999) noted that in many rural regions gender equity and roles may be important for influencing climate adaptation and argued that men and women have different assets, access to resources and opportunities such as education and involvement in community decisions. In general women are often trapped in customary roles.

The study revealed that 1(5%) attained secondary education, 6(30%) advanced to advanced level of education, and 13(65%) attained tertiary level qualifications. This affects their level of understanding in climate change adaptation during the entire period of time. Educated individuals have more knowledge on climate change because they are able to read different articles and their level of understanding is good compared to uneducated ones. Burton (1996) argued that nations and communities with access to climate technology, expertise, information and with for the discussion of adaptation strategies are more likely to be better prepared for climate change.

The study shows that 20(100%) of the respondents were employed. The income levels of the individuals affect their knowledge levels and perception of climate change. Individuals with high income have access to resources and ultimately make decisions in search for information on climate change as compared to low income earning individuals. This is supported by the research finding because 100% of the respondents are employed. Kelly and Edger (2000) argued that if people have a secure income and a diversified food supply they are less likely to be poor and experience hunger. This will often enable to respond to stresses by allocating resources differently.

The study mentioned that 19(95%) of the respondents had knowledge on climate change adaptation while 1(5%) had no knowledge of climate change. Assessment on knowledge revealed that 95% of the respondents were aware of climate change and 5% were not aware of climate change.

Johnson and Marshall (2007) supported that observations are already supporting projections of increasing sea and air temperatures, rising sea levels, acidifying oceans, intensifying storms, and changing rainfall patterns and ocean currents. However they argued that vulnerable people will need guidance and support to anticipate the impacts of climate change and implement adaptation strategies if they are to sustain their

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livelihoods and quality of life into the future.

The researchers identified that the respondents got information on climate change from the following in their proportions.13(65%) from government ministries,1(5%) from traditional leaders,2(10%) from donor agencies and from friends 4(20%).Different sources of information on climate change influences the perception of different individuals on climate change and adaptation. Thomas and Twyman (2005) argued that institutional assets can be information systems, financial and risk sharing systems, insurance, education and warning systems that directly or directly to address local, national or regional vulnerability to climate change and variability. The study observed that there was no information got from relatives and church.

The study revealed that 13(65%) cited deforestation as a local cause of climate change, 2(10%) cited emission of gases, 3(15%) cited fossil fuels and 2(10%) cited stream bank cultivation. However identifying the causes of climate change may influence the perception of individuals on control and adaptation. International Federation of Red Cross (2019) agreed that vulnerability can be defined as the diminished capacity of an individual or group to anticipate, cope with, resist and recover from the impact of a natural or man –made hazard. The research finding agreed with the above statement that deforestation was a local cause of climate change.

The study mentioned measures to be utilized by the community in the adaptation of climate change. The following was highlighted 11(55%) education, 2(10%) awareness campaigns, 5(25%) growing small grains, 1(5%) law enforcement and 1(5%) field days. The measures suggested but the respondents may influence positive behavior change on climate change adaptation.Colding etal (2004) argued that the capacity to plan, learn and reorganize in the face of change is dependent on novelty, creativity, experimentation, learning and planning. Without it any response to climate changes will be reactive and there will be less opportunity for input from others.

The respondents noted that the community had adaptation methods on climate change. It revealed that 7(35%) cited growing small grains,4(20%)digging deep wells,5(25%) food preservation,3(15%)keeping small livestock and 1(5%) vending. The adaptation methods mentioned by the respondents may influence the perception of the whole ward thereby realizing benefits from them. Gonzalez and Benito (2001) argued that attachment to the occupation such as pastoralists, loggers and farmers can have low adaptive capacity because of the attachment to their occupation. Minnegal etal (2004) further argued that when a person with a strong occupational attachment is suddenly faced with the prospect , they are no longer able to continue in their current occupation. They do not only lose the means of earning an income but they lose an important part of their identity.

The respondents mentioned that the community had indigenous knowledge systems in the adaptation of climate change. It showed that 9(45%) mentioned Zunde Ramambo,4(20%) rain making ceremonies,3(15%)predictions,2(10%) behavior of ants and 2(10%) growing small grains. Indigenous knowledge systems may influence the perception of the community if good results do prevail. Cinner (2005) agreed that some individuals have invested substantially into developing local environmental knowledge and can detect subtle changes in resource conditions over time. However this investment usually means that individuals are less likely to move and develop it again elsewhere. Cinner (2005) further argued that while individuals with high levels of local knowledge are often well adapted to current conditions they are less likely to possess a lower capacity to effectively respond to climate changes.

The findings on the interview

The interview was carried out following an interview guide to all the interviewees. All the interviewees agreed that they have knowledge on climate change. The District Agritex Officer cited climate change as changes in weather patterns caused by a number of activities destroying the ozone layer. This was supported

by 2014-BBC NEWS defining climate change as a pattern of change affecting global or regional climate as measured by yardsticks such as average temperature and rainfall, or an alteration in frequency of extreme weather conditions.

Further stressed that it disturbs agricultural practices and come in the form of droughts and floods. Revealed that they get information on climate change from workshops by implementing partners such as Caritas. Highlighted that they rely on pamphlets. Hence showed that they have climate knowledge within the department. The availability of information on climate change may influence the individual's perception on climate change.

The Environmental Management Officer described climate change as change of weather patterns by natural or manmade activities leading to global warming. The 2014- BBC NEWS mentioned in the review of related literature that this variation may be caused by both natural processes and human activity. The 2014-BBC NEWS further mentioned that global warming is one aspect of climate change. Cited that they get information on climate change from the rural district council, government departments, on governmental organizations and studies. The study showed that the rural district council has got a good number of sources on climate change information.

The Environmental Health Technician cited climate change as change in the atmosphere due to activities of humans to satisfy their needs thereby affecting land and themselves. Stated that they get information on climate change from civil protection unit, articles, internet, colleges and training workshops. The study shows that the environmental health department has different sources of information on climate change. Christensen etal (2007) revealed that research into the possible drivers of climate change and the possible approaches to adaptation and mitigation has increased in recent years. This explains that the people have different sources of information as far as climate change is concerned.

The Principal Environmental Health Technician noted that climate change is associated with ozone layer depletion, heavy winds and floods. Further argued that there are continuous droughts due to erratic rains. Yohe and Tol (2002) argued that many developing countries rely heavily on agriculture that is directly affected by climate change. Highlighted that they get information on climate change from ZBC, internet, Ministry Of Health, Ministry Of Agriculture and implementing partners. The study showed that information on climate change is readily available.

The Livestock Specialist described climate change as shifting bank cultivation rainfall patterns in a natural pattern and through anthropogenic activities, for example, deforestation and stream leading to siltation of available rivers and streams. Christensen etal (2007) mentioned that although anthropogenic emissions of gases associated with the use of fossil fuels is mainly from the rich industrialized countries, the impacts of climate change will be more severe in poor developing countries. Argued that climate change have altered plant species citing that there are now more of invader species which are limiting grazing area. Revealed that perennial grass species such as hyperemia species are fast disappearing.

Noted that exotic beef breeds such as Brahman has failed to withstand the effects of climate change and now left with indigenous breeds. Get information on climate change from traditional leaders, Civil Protection Unit, Ministry Of Agriculture And Media. The study shows that traditional leadership is involved in the dissemination of climate change information to its subjects.

The Crop Specialist just appreciated and acknowledged that climate change is within us. Noted that they get information from sponsored workshops. The study showed that climate change information is mainly got from sponsored workshops. Kates (2000) noted that adaptation to climate change did not receive much attention in the first years of the international climate change studies. Adaptation has recently been covered more extensively and has an important place in the 4th assessment report of the IPCC (2007).Halsnaes and

Traerup (2009) argued that there is an emerging process of seeing climate change as a mainstreaming issue that implies that vulnerabilities and adaptation strategies are linked to the development of poverty reduction strategies.

The EMA officer described climate change as seasonal changes over a period of 30-35 years in terms of rainfall and temperatures. The Intergovernmental Panel on Climate Change (2007) noted that in developing countries climate variability and change will enhance heat and moisture stresses to a long list of existing problems. The Intergovernmental Panel on Climate Change (2007) further stressed that temperatures have already increased by an estimated 0.7 degrees Celsius compared with pre-industrial levels. Get information from traditional leaders, pamphlets, books and internet. The study showed that the get information on climate change from pamphlets and books among other already sources so far.

The Vet Animal Health Officer described climate change as the depreciation of rainfall leading to droughts. Downing etal (2005) argued that climate change has consequences in many areas of human activity and some consequences directly affect the economy for instance agriculture production and energy consumption. Argued that it results in poor grazing for domestic animals due to erratic rains which lead to erratic dipping or no dipping at all. Noted that tick borne related diseases are on the increase due to erratic dipping as a result of water shortages. Get information on climate change from farmers, workshops, visual assessments and media. The study showed that it get information on climate change from farmers and visual assessments.

The Schools Inspector cited climate change as a general rise in atmospheric temperature globally due to green house gases effect. Climate change can lead to significant rise in sea level and catastrophic events with implications on migration and the capital stock. Climate change would also have a negative impact on biodiversity and the ecosystem although these effects are still partly unknown (Tol 2005). Noted that there is depletion of ozone layer and other natural cyclic changes. Concluded it is largely anthropogenic, that is, man induced. Get information from internet, university material O and A level textbooks. The study showed that they get information on climate change on university material, O level and A level text books.

All the interviewees cited deforestation as a cause of climate in the ward. The District Agritex Officer argued that stream bank cultivation and ploughing upstream result in siltation which results in floods when rains come. Gunderson and Holling (2002) argued that the effects of climate change are increasingly compounding the already pervading pressure on resources and in some cases the social, economic or ecological conditions may become so untenable under a new climate regime. Hence people are practicing stream bank cultivation as a strategy to follow up areas that have moisture availability throughout the year. However the practice is strongly a bad practice.

The Environmental Management Officer noted that burning of fossil fuels such as firewood; petrol and diesel as a cause of climate change due to the centrality of ward 13.The community adopt those alternatives that contribute negatively to green house gas emissions. Further noted that they are many private vehicles, buses and trucks at the growth point.

Cited poor waste management at the growth point as a contributory factor to green house gases formation. Marshall and Schuttenberg (2006) argued that climate change is a global challenge yet there is much that can be done at local level to minimize impacts and capture opportunities. They further argued that every effort must be made to stabilize greenhouse concentrations before climate systems passes thresholds that cause irreversible damage.

The Environmental Health Technician argued that non engagement of community by traditional leaders, lack of knowledge and poor waste management as causes of climate change in the ward. Engagement changes the perception of the people involved. If not engaged they will continue to contribute negatively in the climate change adaptation process .Marshall (2008) argued that that adaptation strategy cannot succeed

if they stand alone or pursued outside existing institutions and frameworks. Marshall (2008) further explained that the pervasive influence of climate change means that climate adaptation needs to be integral to nearly every aspect of planning and policy.

The Principal Environmental Health Technician added that congestion of traffic as a result of centrality of ward 13 as a cause of climate change. The community must deal with environment user friendly options like solar. There is continuous burning of fossil fuels like petrol and diesel. Marshall and Schuttenberg (2006) explained that climate change adaptation require the need for investment in adaptation activities be reflected in national, local policies and budgets.

The Livestock Specialist cited shifting natural rainfall patterns as the main cause of climate change. Further explained that stream bank cultivation lead to siltation of rivers and streams exposing them to floods. There is need for continuous education regarding stream bank cultivation. Kallstrom and Ljung (2001) convincingly argue that people must be satisfied with their situation in terms of control over decisions in order for social sustainability and environmental goals to be achieved. Hence people must continue to utilize appropriate arable lands for cultivation.

The Crop Specialist highlighted that use of crop herbicides and fertilizers do affect the atmosphere because of chemicals within them. It is recommended to use recommended rates of application by the manufacturer. Daily etal (2000) argued that feasibility of strategies might also be limited by the capacity of individuals or groups to comprehend or prepare for predicted changes. For example it is difficult to use organic material on a large scale. Added that stream bank cultivation as a cause of climate change in the ward.

The EMA officer explained that use of non renewable sources of energy as a cause of climate change in the ward. Environmentally smart methods must be utilized in the process. Tol (2002) argued that economic and technological capacity to adapt to climate change is often limited in developing countries.

The Vet Animal Health Officer only cited deforestation as people opens new settlements and fetch firewood. The rural district council must have a mechanism for development control. The Intergovernmental Panel on Climate Change (IPCC 2007) argued that there is still controversy on the contribution anthropogenic activities to temperature increases.

The Schools Inspector cited emission of gases by local industry as a cause of climate change. Argued that climate change has no boundary. The majority of people in the ward are not aware of the local ginnery and other related small to medium industries' contribution of gas emissions. They are centered mainly on deforestation among others. Marshall and Schuttenberg (2006) explained that climate change is a global challenge. Effects from one continent, region and country affect the whole world. Noted that heavy siltation of rivers and streams as other causes of climate change. Observed that there is largely wide use of Blair toilets in the ward leading to the production of methane gas which is a green house gas.

All the interviewees agreed that the community have adaptation methods to deal with the effects of climate change. The District Agritex Officer cited that they are practicing climate resilient agriculture and conservation agriculture which minimize erosion and siltation. However people are reluctant to utilize them fully.2014-BBC NEWS argued that climate change adaptation refers to adjustments societies or ecosystems make to limit the negative effects of climate change or take advantage of opportunities provided by a changing climate. Therefore farmers are encouraged to grow crops which can withstand droughts. The 2014-bbc news noted that adaptation can range from farmers planting more drought resistant crops. Noted that there are into small grains production and rearing of indigenous chickens and goats.

The Environmental Management Officer cited that boreholes are being drilled in the ward to avert water shortages imposed by continuous droughts. However donor driven projects brings in dependency syndrome

into the community. The Intergovernmental Panel on Climate Change (IPCC 2007) argued that climate change involves not only global warming but also other physical changes such as precipitation, intensity and frequency of storms and the occurrence of droughts and floods. Highlighted that they are growing small grains and very early crop varities.Observed that people are relocating from flood plains to higher suitable grounds to safe guard lives and property. Noted that there are into reforestation and aforestation programmes.

The Environmental Health Technician cited preservation of some trees like teak /mukamba as an adaptation method to the effects of climate change. The worst part of these preserved resources is they end up in the companies of large companies who are into production with those materials. The communities do not usually benefit from them. Explained that trainings on climate related diseases such as malaria, birlharzia and diarrhea are very crucial. Tol (2005) explained that the number of additional deaths coming from an increase in temperatures has been estimated for specific diseases, for example malaria. Tol (2005) argued that the indirect consequences of climate change on health through food availability, water constraints, air quality or conflicts induced by climate change are mainly unknown.

The Principal Environmental Health Technician noted that there is need to rehabilitate local dams to boost nutritional gardens. The rehabilitation needs to be done by experienced and competent people. Otherwise the rehabilitations will not last longer.Yohe (2000) mentioned that measures cover a correspondingly broad range from direct interventions such as dyke building to prevent flooding, large scale relocation of farmers, new crop selection and building of dams to expand irrigation, to capacity development in public administration, civil society and research.Smit and Skinner(2002) argued that there are concerns within the agricultural sector and it is believed that adaptation in developed countries with temperate climates will not only reduce vulnerability but be able to realize opportunities and production. Called for the use of charcoal stoves as they are environmentally user friendly. Argued that people should use public transport which reduces burning of fossil fuels resulting in the reduction of green house gases in the ward.

The Livestock Specialist cited that the villagers are practicing climate smart agriculture, for example, conservation agriculture, intercropping and crop rotation. However it is not every farmer who is into it. Thomas and Twyman (2005) explained that institutional assets can be information systems, financial and risk sharing systems, insurance, education and warning systems that directly or indirectly or indirectly address local, national or regional vulnerability to climate change and variability.

The Crop Specialist cited production of small grains and use of organic manure as adaptation methods by farmers. However argued that small grain production is visible to many mostly under donor sponsorship. Donor syndrome has become part and parcel of our lives in the ward. Bojo etal (2004) argued that this process has so far primarily donor driven because many developing countries do not consider climate change as one of their greatest concerns. More immediate needs for immediate for economic growth and poverty reduction take priority. Bojo etal (2004) further argued that it is systematic that most of the first generation poverty reduction strategy papers (PRSPs) had little reference to environmental concerns let alone climate change.

The EMA officer concurred with the crop specialist that small grain production is mainly through implementing partners like Caritas. Bojo etal (2004) noted that this process has so far primarily donor driven because many developing countries do not consider climate change as one of their greatest concerns.

The Vet Animal Health Officer cited destocking of beef animals to save them from the effects of drought. A number of farmers keep their cattle in drought situations until they die instead of destocking to realize income for other household uses.Dai etal (2004) pointed out that many developing countries have already experienced weather events in terms of floods, droughts, heat waves and tropical cyclones that are more frequent or intense than previous experiences. Dai etal (2004) further explained that the resulting impacts

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point to the consequences on the environment, production systems, and livelihoods from future climate variability and change. Argued that there is need for integration of beef animals and small livestock like goats, chickens and sheep. Explained that these animals can manage to withstand the effects of climate change.

The Schools Inspector cited growing small grains, use of very early maize varieties like tsuro/hare as adaptation methods by the community. However the majority of farmers wait for the presidential which may not be very early varieties. Kelly and Adger (2000) argued that the needed adaptive actions to drought will lead to dependence of credit schemes to purchase drought resistant crops and crop varieties complete crop loss will not cause hunger but also leave people with debts they are unable to repay. Barnett and Mahul (2007) noted that some measures might solve one problem while creating another. Barnett and Mahul (2007) further noted that credit schemes and new crops might have to be accompanied by weather insurance and has been tried experimentally in some developing countries. Added that they are keeping donkeys and goats. Argued that donkeys are hardy and can be used throughout the year thereby preserving beef animals. Further argued that goats are dry climate animals.

The District Agritex Officer suggested that awareness meetings on climate change be held regularly. Present day communities prefer meetings with entitlements such as food, sunhats, t-shirts, and jackets among others. Haller (2002) supported that can be formal through legal structures and government agencies, or informal through friends, families and associates. Fenton(2004) argued that individuals with stronger, more informed and more effective networks have reciprocal connections of interactions, increased levels of trust and access to information that are exchanged to mutual benefit. Called for appropriate settlement patterns to counter the effects of climate change. Argued that housing for livestock be appropriately located to avoid excessive winds, light rays and floods imposed by climate change.

The Environmental Management Officer noted that the community be educated on dangers of climate change. People have a problem of wanting to experience the calamity itself .Recently people shifted from along Mutora Huku River in the ward after being affected by the floods Marshall (2007) noted that environmentally educated and aware resource users tend to be more flexible and supportive of resource protection strategies. Marshall (2007) argued that they can develop identities which make them less dependent on traditional resource management practices and more willing to adapt new practices that enhance not only their own resilience to change but that of the environment. Cited that awareness campaigns be regularly carried out. Explained that environmentally friendly farming activities are done all the time. Added that the communities do engage in reforestation and aforestation programmes.

The Environmental Health Technician called for decentralization on issues to do with climate change. Sometimes those who enforce the legislation seem to be absent in the ward. To an extent political interference exert pressure on those who enforce the legislation. Stressed that legislation be enforced on environmental offenders without fear or favor. Carpenter and Gunderson (2001) argued that governance systems that actively involve community members in the decision making process and are flexible and open are believed to assist in the maintenance of social resistance.

The Principal Environmental Health Technician suggested conscientisation of community through advocacy meetings. Active participation by community members is called for. Carpenter and Gunderson (2001) argued that by increasing equality in the decision making process the adaptive capacity of resource users can be enhanced since the system can better experiment and learn from different strategies and incorporation new information into the design of new strategies. Called for the support of sub committees on issues of monitoring and evaluation of activities which may lead to climate change gradually. Stressed the need to enact and enforce bylaws to promote healthy environment, that is, proper waste management, tree preservation and monitored and evaluated development projects.

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The Livestock Specialist called for breeding animals which suit the local environment, for example, Mashona beef breed. Climate change itself can be a natural management tool. Marshall (2007) argued that developing suitable strategies for enhancing social resilience is best done in participation with those likely to benefit.

The Crop Specialist suggested for education and awareness joint ventures local extension staff and village heads. Education and awareness campaigns are only vital to those who are ready to learn. Further suggested that field days on adaptive crops be carried out yearly. Marshall (2007) argued that once priorities areas have been identified strategies will be identified that best meet the goals of the adaptation plan.

The EMA officer noted that continuous environmental education be carried out regularly. Other community members must be involved in the teaching of their counterparts. Burton (1996) mentioned that nations and communities with access to climate technology, expertise and information and with the discussion for adaptation strategies are more likely to be better prepared for climate change. Argued that law enforcement be practicable all the time to offender. Explained that the community does observe environmental days such as tree planting day among others.

The Animal Health Officer suggested education and awareness to be carried out regularly. However resources may not permit especially with this hyperinflationary condition. Marshall (2007) highlighted that environmentally educated and aware resource users tend to be more flexible and supportive of resource protection strategies. Called for destocking of beef cattle to avoid 100% losses in the event of deaths. Further suggested for integration of beef and small livestock.

The Schools Inspector cited that there is an increase in teachers using spectacles, shades and umbrellas as adaptation measures. However poverty will be an impediment to this cause. Schools have introduced sunhats as part of the school uniform. Classrooms are being designed to allow for more air circulation. Unfortunately school infrastructure has been damaged and lives lost

through heavy rains and winds that rocked the ward. Cinner (2005) argued that some individuals have invested substantially into developing local environmental knowledge and can detect subtle changes in resource conditions over time.

All the interviewees concurred that they are indigenous knowledge systems that can be used in the adaptation on the effects of climate change. There is a generation of people who cannot understand the dynamics of indigenous knowledge systems. The District Agritex Officer cited flowering of mugangacha tree (Lannea discolor) as a good indicator of a good season and vice versa. Commented that behavior of ants indicate either a good or bad season. Illustrated that moving of ants in and out of holes indicate good rains and vice versa. Armitage (2005)argued that adaptive capacity is enhanced by the existence of institutions and networks that learn and store knowledge and experience, create flexibility in problem solving without comprising the ability to cope and adapt to future change.

The Environmental Management Officer cited preservation of scared trees, for example, Lannea discolor (mugangacha tree) as an indigenous knowledge system to preserve the ecosystem as natural as possible. Some individuals do not value indigenous knowledge systems. Thomas and Twyman (2005) argued that policies on adaptation to climate change must be very carefully devised as they find themselves in a complex reality of societies that are poor and vulnerable for a wide range of reasons. Argued that bathing and washing in the rivers with artificial soaps is traditionally prohibited. Suggested that they lead to drying up of natural water sources.

The Environmental Health Technician considered endangered tree species such as teak/mukamba as scared

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as it is protected by traditional leadership. Punishments are not stopping offenders. Offenders are fined by chief, headman and village heads. Johnson and Marshall (2007) argued that vulnerable people will need guidance and support to anticipate the impacts of climate change and implement adaptation strategies if they are to sustain their livelihoods and quality of life into the future.

Principal Environmental Health Technician argued that cutting down of trees is traditionally restricted though offenders exist within the ward. People are prohibited but go on to commit related behaviors. Cited that use of sledges is prohibited traditionally as well as stream bank cultivation. Commented that traditionally African culture is against indiscriminate waste disposal. Noted that it is part of African culture to plant both indigenous and exotic trees to provide fruits, fuel firewood and shade in the adaptation process. Hundbloe (2002) mentioned that developing strategies for adapting to institutional and regulatory change can be just as important as preparations for resource degradation.

The Livestock Specialist observed that only tolerant beef breeds be reared to suit local climatic conditions. Climate change is not always harmful but can come up with good opportunities. Fenton etal (2007) argued that in some regions climate change experts are predicting that higher rainfall can be expected and this open up new and profitable agriculture opportunities.

The Crop Specialist concurred with others on the behavior of ants. Traditionally the community has its own warning systems which they utilize. Hansen etal (2003) argued that the growing threat of climate change because of interdependencies between people and ecosystems may lead to efforts to build resilience of the ecosystem.

The EMA officer suggested growing of small grains as is being championed by traditional leaders. The community must grow crops that fit in well in their local environments. Stressed that scared trees such as Lannea discolor (mugangacha tree) are used to observe seasons culturally. Hansen etal (2003) noted that there is much that can be done at the local level to reduce the impacts of climate change.

The Vet Animal Health Officer noted that villagers collect stock feed from natural or traditional trees to feed their cattle, goats and sheep during periods when grazing is scarce. There is need to prepare for difficult times of the year while resources to use are still readily available. The Intergovernmental Panel on Climate Change (IPCC 2007) argued that they also play an active and crucial in helping people anticipate and prepare for impacts of climate change

The Schools Inspector mentioned zunde ramambo done to keep surplus food stuffs utilized in the event of lack by the community. Of recent people have been neglecting the concept citing irregularities. Further mentioned father granary concept where wife or wives deplete their reserves and the father chips in to alleviate family food shortages. This is mainly associated with those with polygamous families. Explained that there are father's fields which are specifically handled by him though labor is drawn from all family members. Gunderson (2000) argued that adaptive describes the ability to respond to challenges through learning, managing risk and impacts, developing new knowledge and devising effective approaches.

Based on research objectives it was concluded that humans have a bigger contribution towards climate related problems. However natural cyclic changes cannot be ignored in the process in ward 13 of Gokwe North District. The community usually learn from past bad experiences of climate related problems for example flood that hit the community along the river in early 2020.

It was concluded that there is need for capacity building of the ward as far as climate change adaptation is concerned. Resource materials are in short supply from central government to ward level.

The respondents from both the questionnaire and the interview were all aware of climate change. Some

could even go deeper in their explanations on the questionnaire and the interview. They were acquainted with the causes of climate change in the ward.

It was concluded that they are adaptation methods available to them. However some cannot utilize the adaptation methods. The respondents agreed that the community has indigenous knowledge systems in place to detect coming weather events. The detected events may determine good harvests or famine. This is good for preparation.

Recommendations

Throughout the year climate related issues must be prioritized at national, provincial, district and ward level. This is because climate related issues come in different circumstances, that is, strong and heavy winds, lighting, and floods among others. Human and domestic animal lives were lost early 2020 due to the floods in the ward.

Communities must be capacitated in the area of climate change adaptation. Usually the time disaster strikes the community has no alternative options to deal with the catastrophe. In all the programmes community involvement and participation must be activated. Climate change adaptation programmes must not be imposed on the community to ensure sustainability. Their indigenous knowledge systems regarding climate change adaptation must be respected and adopted where the possible. The key players in environmental business must enforce relevant laws on environmental offenders without fear and favor. The rural district council through its environment management department must enact and enforce by-laws that restrict all forms of environmental damage.

Primary and secondary schools must be involved vigorously in environmental education. The new updated curriculum in education need to be strengthened in the area of climate change adaptation. They should be climate change debates to conscientise the learners at an early age.

The community is called upon to utilize clean sources of energy such as solar energy. There is need to come up with alternatives that will replace those sources which contribute towards green house gas emission. Community members must be allocated land for all purposes in areas that are not prone to climate change disasters. Even livestock must be safe guarded from the harmful effects of climate change and variability. Climate change affected members must be relocated to safe place with their belongings. This is because floods continue to affect previously affected areas such as flood plains.

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