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Indigenous Knowledge Systems and Wetland Management in the Wake of Climate Change in Mashonaland East Province: Exploring Potentiated Links

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Abstract
Wetlands provide key resources for rural livelihoods in communal landscapes and rural economies world over. For the majority of communal farmers in Zimbabwe, wetlands support diverse communal livelihoods. However, in recent years, wetlands have experienced diverse forms of degradation which in turn affects rural livelihoods. Based on evidence collected from focus group discussions and key informant interviews this paper explores how indigenous knowledge systems is a potential management package for the restoration of wetlands in dire situations. Focus Group Discussions (FGDs) were handy in capturing collective community knowledge systems. The FGDs also generated commonly employed responses to changes impacting wetlands. Key Informant interviews mainly produced information related to both institutional and unique information associated with identified informants. Wetlands support diverse livelihoods such as gardening, crop farming, livestock grazing and fruit production. Wetland restoration is pivotal in sustaining and reviving these located wetlands and hence benefit the rural poor. Given the holistic, socio-cultural and environmental embedded nature of indigenous knowledge systems, it is worthy embracing local community environmental practices in fostering sustainable wetland management in an era marked by climate change. Results indicate merits of incorporating Indigenous Knowledge Systems in wetland management. Indigenous Knowledge embraces technical, institutional and religious spheres of wisdom. Reincarnation and restoration of these forms of wisdom seems to be sound ammunition of sustaining wetlands in a climate change epoch.

I. INTRODUCTION

Wetlands support diverse livelihoods ranging from crop production to foraging (Mccartney et al., 2010; Evans, Giordano and Clayton, 2012; Nyamadzawo et al. 2015)Whitlow, 1989; Chenje and Johnson, 1996; IRA, 2006, Koppen et al. 2007; EPA, 2012; Mulatu et al. 2015;). Hardlife et al. (2014) noted that wetlands are critical in providing livelihood benefits such as recreational pursuits, income, food production, and nutrition gene bank and microclimate modification. This diversity of merits derived from wetlands is a clear indication that wetlands are crucial in supporting rural livelihoods.

Whilst the wetlands are important in supporting livelihoods, the same resource has experienced deterioration on human account (Murombedzi, 1991; NCSE, 2003; EPA, 2012; Lanyero, 2013; Nyamadzawo et al. 2014). Diverse population pressures have impacted on wetlands. Some scholars believe that 90% of fresh water wetlands have disappeared due to abuse by people (Botkin and Keller (2000) in Hardlife et al. 2014).

Other than human induced impacts on wetlands, the same resources are also subjected to a set of physical constraints chief of which is climate change (Joyce, Simpson and Casanova, 2016). Such physical impacts range from droughts, desiccation of wetlands, shrinkage in wetland sizes, reduced water inflows of water, high rates of water loss due to increased rates of evaporation and above all accumulation of sediments in wetlands (Unganai and Murwira, 2010; IPCC, 2014; Joyce, Simpson and Casanova, 2016; Kupika et al. 2019). Desiccation of wetlands in Zimbabwe is largely blamed on climate change (Unganai and Murwira, 2010; GoZ (2015) in Mafongoya (2017). The capacity of wetlands to store water over recent years has also been compromised. Increased frequency and severity of drought, erratic rains and heat waves have all magnified the evaporation rates (Joyce, Simpson and Casanova, 2016; Kupika et al. 2019). Kupika et al. (2019) have noted how climate change is affecting wetlands in the North-west Hurungwe district of Zimbabwe. Some wetlands which used to have water throughout the year have since dried up.

In relation to the management of resources, scholars like Hardin '(1968,'1995) and followers like Whitlow (1989, 1990) and Dugan (1990) argue that communities do not manage and protect common property such as wetlands. These scholars contend that rural communities are over exploiting resources which often leads to environmental degradation. In sharp contrast to this view, numerous scholars around the world document how communities make use of Indigenous Knowledge Systems (IKS) to sustainably use wetlands (Gadzirayi et al. 2006; Ringim et al. 2015; Owen et al. 1995; Nhema, 2004; Kopen et al. 2007).

Indigenous knowledge, in relation to wetlands management embraces several platforms. IKS guides and provides a platform for sustainable use of wetlands through such platforms. Wetlands can sustainably be managed and used through use of organic manure, mixed and inter-cropping to reduce runoff, using special plants such as sedges (*cyperus ssp*), protection of native trees such as *cordatum syzygium* (mukute) to preserve springs and sponges (Manyanhaire and Chitura, 2015). In some instances, rituals and taboos are employed as means to manage wetlands and support livelihoods (Ndlovu and Manjeru, 2014). These are some of the documented means illustrating relevance of IKS in wetland management.

However, the potential of IKS in wetland management has never been substantively explored in a manner which incorporates wetland livelihoods in a climate change era. Further, the emerging impact matrix on rural communities and households needs understanding as this is crucial for rural communities. Beyond this, the prospect and relevance of IKS in yielding sustainable management of wetlands and livelihoods in a space where climate change is taking place was hardly contextualised. To this end, this paper highlights the prospects of harnessing IKS in local level wetland management given the stochastic and uncertainty associated and induced by climate change.

II. RESEARCH METHODOLOGY

- *Locational Context*

The study was carried out in Mashonaland East Province in Zimbabwe. Three wetlands sites were conveniently selected for this study. Key premises for selection of the three sites were: consideration of agro ecological and physical differences between the three sites which at the same time are representative of the province under study. The differences ranged from rainfall amount, temperature patterns, altitude as well as the hydromorphic characteristics of the wetlands in these three sites. Seke is found in the central Highveld (high rainfall region), Murehwa in the middle veld (moderate rainfall amount) and Mutoko on the edges of the Lowveld (low rainfall zone). Annual temperatures in Seke are cool, warm in Murehwa and hot in Mutoko. The figure 1, below is a map showing the extent of the study area, Mashonaland East Province as well as the location of the study sites.

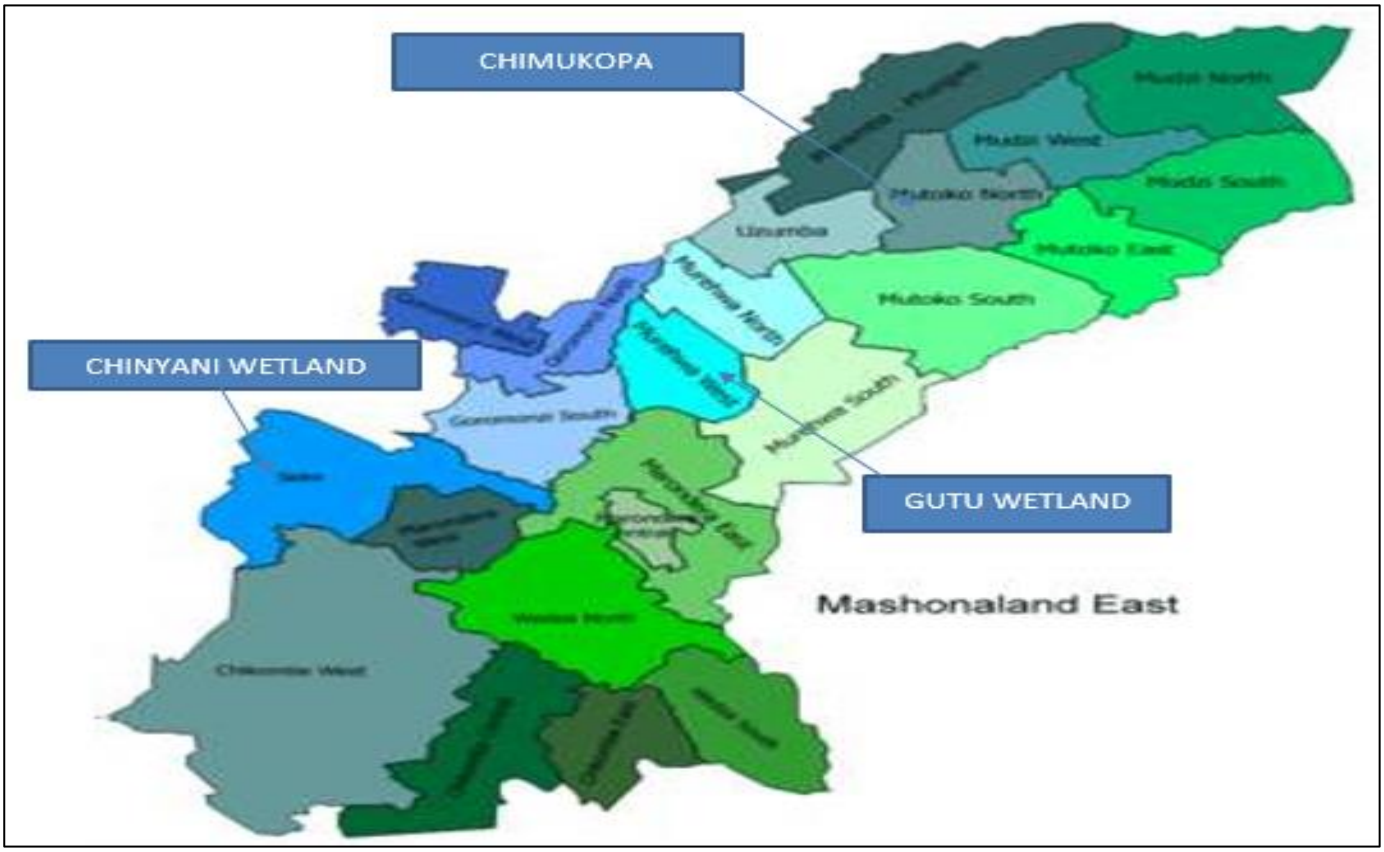

Fig 1 Locations of Study Sites IN Mashonaland East
Source: Zimbabwe Statistics 2012

➢ *Data Collection Methods*

The mixed approach was used for this study. Key factors were considered critical for the selection of this approach: compatibility of the research methods, nature of the research paper objectives as well as the research questions was all influential (Cameron, 2014). The nature of this study and its emphasis on the data on wetland dimensions has also dictated the use of quantitative methodology. The emphases on capturing the perceptions, interaction and institutional processes and the need to secure in-depth and local understanding of climate change as an external phenomenon have also informed the use of qualitative methods.

- *Geographical Information Systems*

Wetland changes from 1985 to 2019 were captured through GIS satellite data for Landsat 8, 7 and 5. This package combined remote sensing and Geographical Information Systems. Images derived from the two methods were processed using ENVI then later exported the classified maps to ArcGIS. A hand held GPS was used to collect samples from the three study sites. Derived data was verified using knowledge from the residents in the three study sites.

Remote sensing was used because it was an efficient approach to get data for longer periods of time. Geographical Information System (GIS) package mapped and traced wetland dimensions in the three study sites for a 34-year period stretching from 1985 to 2019. GIS thus captured changes related to the geographical extent and shape of each wetland in the three study sites. To this end, GIS enabled the production of high quality maps. These maps made it easy to interpret changes affecting the wetlands in the study sites.

Remote sensing came handy for the article objectives. Satellite images produced were manipulated to produce data suiting central interests of this article. Such data ranged from wetland size changes and land use cover changes. Further, the same data was cross checked with key recorded climatic variables: rainfall and temperature. This proved crucial as inferences made enriched the collected scientific data. Data derived from GIS also provided the basis for other data collection methods such as FGDs and Key Informant Interviews. This was insightful for further analysis and inferences on wetland changes over the 34 year period.

- *Focus Group Discussions*

Focus Group Discussion was used to gather key qualitative and group based information. As for the selection of members for the FGDs, purposive stratified sampling was used to identify households that depend on wetlands. Households who depend on wetlands were conveniently picked until a desirable sample per site for the three study sites was reached. The basis for objectivity and representativity was guided by the study objectives and ensured that at least key social groups in the villages were represented. For vulnerable groups, local institutions such as village heads were handy in selection of relevant participants.

Focus Group Discussions lend itself to collection of wide spectra of information (Borrego et al. 2009; Creswell et al. 2011). Some of the data generated from FGSs related to group perceptions, experiences and related practices. An assemblage of this kind of data largely provided data on the nature and use of Indigenous Knowledge Systems. Further, FGD provided collective data on communal practices typically adopted by wetland households in times of environmental adversity. The other critical attribute of FGD was that it afforded the researchers and participants to collect relevant data on community response and practices. In addition, the FGDs created a platform to correct and verify the data collected. This was essential to ensure validity of collected data. In addition, FGDs made the researchers' appreciate and understand the 'world views' of the studied communities and how they interpret traditional wetland management practices in the wake of climate change.

- *Key Informant Interviews*

Key Informant Interviews were a critical data collection technique for this article also. Scholars argue and highlight several issues which need to be considered for the selection and identification of key informants for any research (Bryman, 2012). Moxley (2017) warned that key informants need to be useful in triangulation of information. Consideration should be also made on the basis of accessibility and willingness to provide information (Moxley, 2017). Further, a critical aspect considered in this study was the kind of information an individual respondent will provide. These are some of the tenets employed for the selection of key informants for this study.

To this end, the kind of knowledge and experience associated with the Key Informant (Moxley, 2017) was essential in selection of Key Informants. Household heads provided data on household responses to wetland livelihood changes. Village heads and Headman were essential in traditional management practices and Arex, Rural Council and EMA officials provided information on formal institutional management practices.

- *Data Management and Analysis*

Data on wetland changes was computed and simple calculations were made to determine the degree of wetland shrinkage in the three sites. The related wetland data ranged from: size of wetland, shape and other parameters such as water content and riparian vegetation. Using generated data, comparison was then made with data collected from the wetland communities in the three sites to derive insights on the changes and communities' perceptions of such wetland changes.

Indigenous knowledge data is predominantly qualitative (Risiro et al. 2013; Chanza, 2015). To this end, the analysis of such data was largely influenced by the nature of the data gathered during the research process. Data collected ranged from views, practices, perceptions and beliefs, all as facets and forms of IKS. To the end, indigenous knowledge systems, had to be organised according to themes and emerging meanings. In analysing the IKS data, attention had to be given to remain judicious to the objectives of this paper and communities from which the information was generated whilst yielding conclusions which speak to the scientific community. The analysis pathway had to do justice to these three critical spheres.

In relation to the above, three layers of analysis were employed to make inferences from IKS qualitative data. The multiplicity of the methods is in line with the research methodology selected for this study (Teddlie and Tashakkori (2003) in Cameron (2015). As data was being collected, analysis was being done concurrently through continuous participatory involvement of the research subjects and verification of collected data, an approach is termed *ex ante* (Morrison and Richard, 2002). After initial analysis through the SPSS, emerging themes were verified with key informants to ensure some consistency and validity of the data. This constituted the second phase of analysis. The third layer involved pragmatic reflexivity ((Murray, 2001; Malleson et al. 2008; Mundine, 2012). This involved making field based and evidence to analyse IKS qualitative data. This further augmented generating theory using collected data.

III. FINDINGS: IMPACT OF CLIMATE CHANGE ON WETLANDS

➢ *Size of Wetlands*

This section presents perceived impacts of climate change on wetlands in the three study sites. GIS data was only able to capture changes since 1985 hence the 1985 was treated to be the same for 1980 to align with the study focus period. Figure 2 below shows the decrease in size of Chinyani wetland in Seke. Of the three wetlands selected as the research sites, Chinyani wetland had declined the most recording a -80.93% drop in size over the 38 year period since 1980.

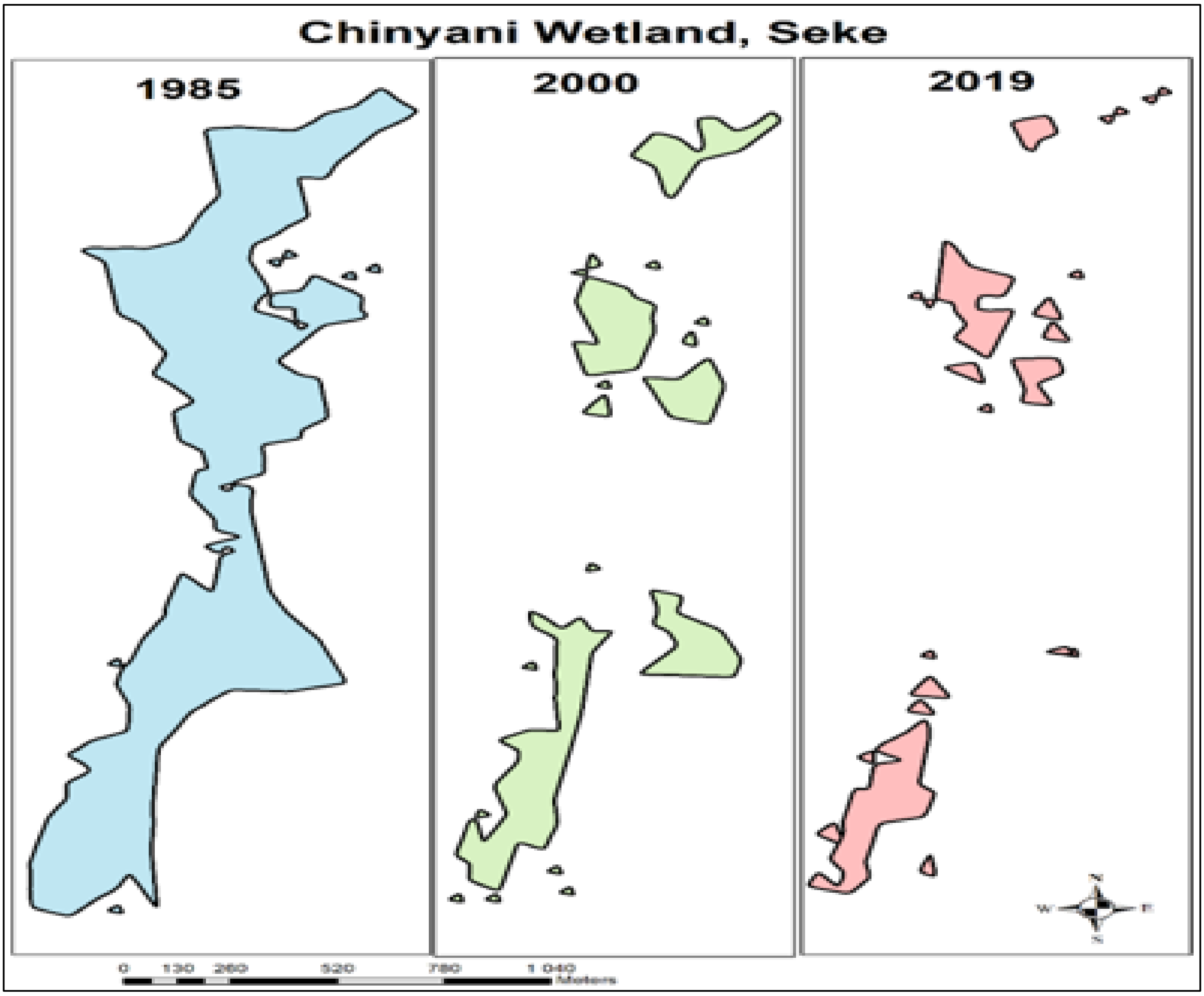

Fig 2 Chinyani Wetland Changes 1985 to 2019.
Source: (https://earthexplorer.usgs.gov)

Below is a GIS generated outline of Gutu wetland (Figure 3). This wetland, located in Murehwa, has also dropped in terms of its size over the 38 year period. Of the three wetlands under review, Gutu wetland registered the least percentage decline of -17.63%.

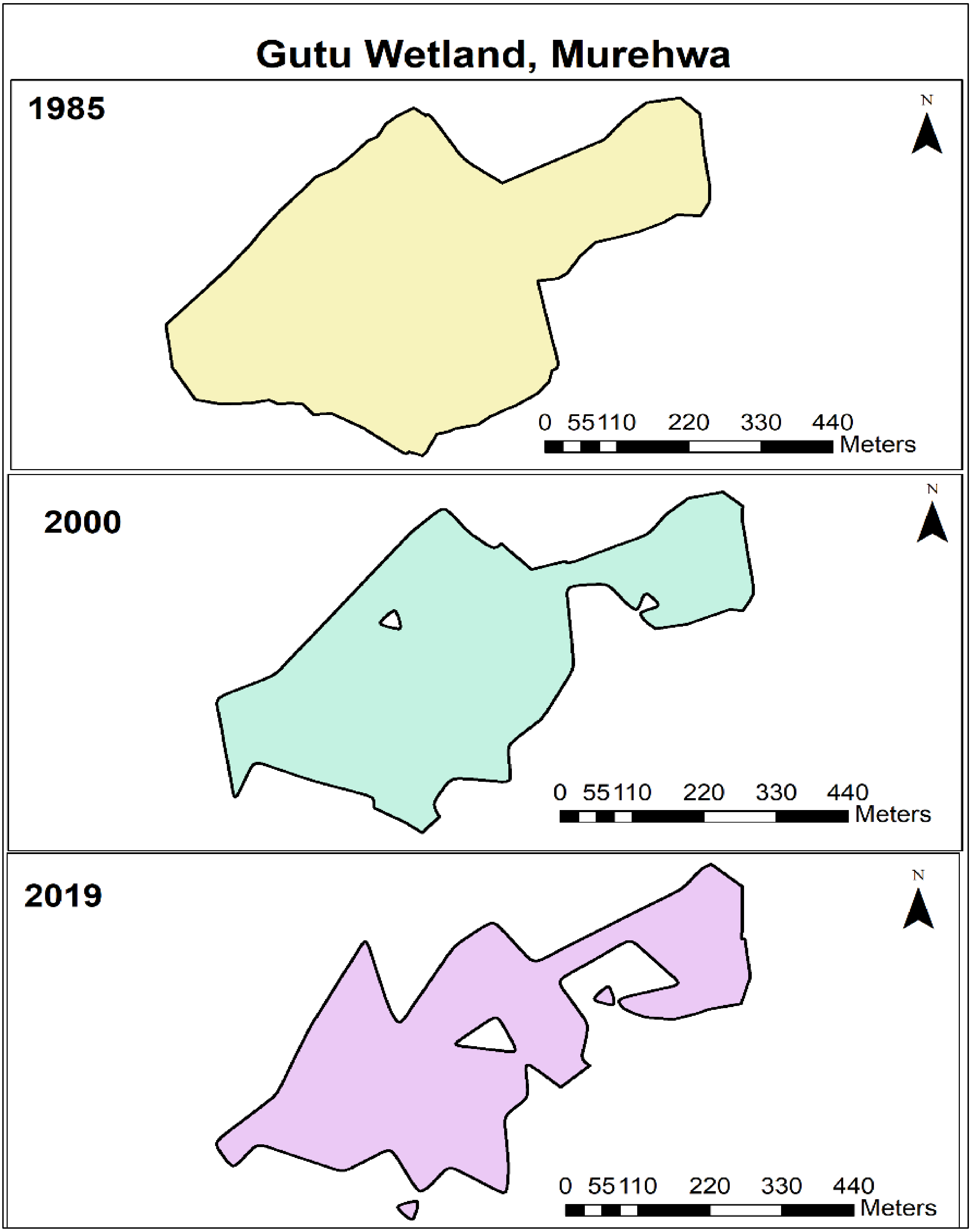

Fig 3 Gutu Wetland Changes 1985 to 2020.
Source :(https://earthexplorer.usgs.gov)

Chimukopa wetland has also lost a significant share of its size over the past 34 years (Figure 4). The wetland covered an area equivalent to 82, 8 hectares in 1985 but that had fallen to 44, 5 hectares by 2019. Of the three wetlands, Chimukopa ranks second, having lost -46.23% of its initial size.

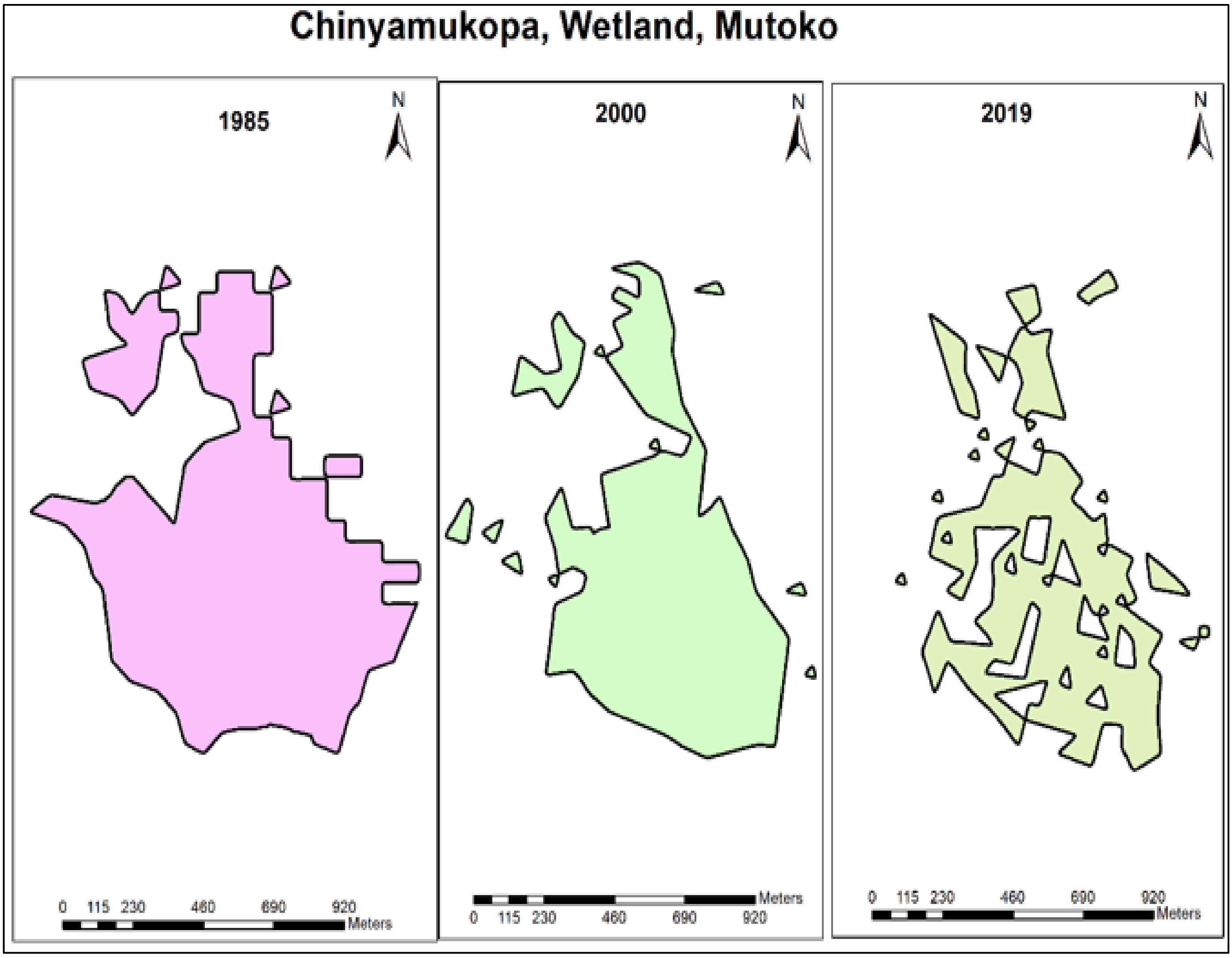

Fig 4 Chimukopa Wetland Changes.
Source (https://earthexplorer.usgs.gov)

Evidence above is testifying that over the last thirty-eight years, wetlands in the three study sites have declined in geographical size. Observations by participants in all the three sites have expressed concern over the shrinking wetlands. For the communities, climate change is the chief culprit for the seemingly demise of wetlands.

- *Wetland Functional Dimensions*

A key facet for the functionality of wetlands is the availability of feeder springs and sponge -effect of wetlands. Most wetlands in the last thirty years have not fared well in this regard. Some streams, springs and sponge-effect (defe -local term) have all disappeared.

Informants and participants to the FGDs made observations related to the above. One villager retorted that *''Wetlands are now mere plains with no feeder springs and rivers. I can cite the example of Ura river which used to supply water to Gutu wetland''*

For both the villagers and Key Informants, some streams and springs are drying up due to limited water flow. Water flow has declined over the past years which has coincided with increased more frequent droughts. For the respondents, all these are signs of climate change.

Water is a key lifeline and is what gives wetlands an essential character to sustainable livelihoods. Observations by key informants and participants to the FGDs lamented and concurred that the quantities of water found in wetlands has dwindled and declined over the last thirty years. One villager, in support of the above observation had the following to say

Water amount has dropped and the water level has fallen. In some worse scenarios, some wetlands have dried up completely.

For the respondents, the decline in water levels is attributable to climate change. For them, declining rainfall amounts and long dry spells coupling more occasional droughts are principal drivers for the falling water levels in wetlands.

Wetland riparian vegetation has dropped over the past thirty-eight years. Hydrophytes such as sedges, reeds and other bigger woody trees such as mukute (*Syzgium Cordatum*), muhacha (*parinari curatellifolia*) and mutsamvu (*Ficus birkei*) have declined in numbers and form. In fact, the main trees such as mukute (*Syzgium Cordatum*), muhacha (*parinari curatellifolia*) and mutsamvu (*Ficus birkei*) have totally disappeared in some wetland sites.

Key Informants and participants in FGDs concurred when they lamented that

"*Most trees and other fruit plants which used to found in wetlands have since dried up due to declining rainfall amounts over the years"*

Though debatable, respondents believe that wetland vegetation has dropped due to climate change. For the wetland communities, as water supplies dwindle, the water loving trees struggle to survive. However, some villagers contend that the disappearance of these trees is due to human clearance as people set up houses on wetlands as is typical in Seke study site.

For the greater part wetlands are associated with damp, soft and sponge soils. In most cases, such soils are clayey soils which show influence of gleying and water logging. For this reason, the soils support water loving plants as discussed above

Observations by several villagers in the three study sites indicated that climate change has clearly denatured wetland soils. Under climate change, the soils have lost their dampness, moisture content and the numbers of organisms which used to survive in these soils. Several villagers lamented that the soils have become poorer than and not as productive as it used to be. To sum up the soil changes in respect of climate change, one villager had the following to say:

The wetland soils have declined in terms of fertility, lost the moisture content and after drying up the soils succumb to compaction and develop cracks…''

Respondents indicated that loss of soils resulted in shrinking wetland size and reduction in its utility value because the soils are easily erodible. In both Murehwa and Seke sites, field observations revealed several patches which the villagers argue came into being on account of the weakened and eroded soils

IV. LOCAL INSTITUTIONAL RESPONSES TO WETLAND CHANGES

As climate change and population pressure take their toll on wetlands, institutions have resorted to the use of diverse tactics and innovations to at least restore, revive and sustain livelihoods. In some instances, households adopt new crops, exchange information and become innovative in sustaining wetlands among other options. Amongst such like responses, this sections turns to present space which IKS presents at both household and community levels..

- *Revisiting Traditional Knowledge Systems*

Misery and frustrations associated with climate change have compelled some villagers to seek salvation in Indigenous Knowledge Systems (IKS). The reincarnation of Indigenous Knowledge systems is seen in the use of earth water ponds which are believed to have the capacity to store and revive local wetland livelihoods. Key players promoting the revival of Indigenous knowledge systems include local traditional institutions such as village heads and Chiefs.

Villagers indicated that the drying up of wetlands has made them reconsider the restoration of waning wetland livelihoods through use of IKS. Some villagers have noted that, recently, there has been an increase in traditional ceremonies and rites intended to restore water in wetlands. These ceremonies have apparently coincided with the dry years. Several narratives motivating local households to revive IKS have been on the rise of late according to some villagers. It appears, a range of IKS strategies is being revived so as to safeguard wetlands and ultimately enhance or restore wetland livelihoods.

- *Local Traditional Leaders' Responses*

Traditional leaders represent the lowest and most immediate institutional pillar in governance structures in communal areas. Under this umbrella, there are village heads, headmen and chiefs. Besides being the custodians of resources and land in communal areas, traditional leaders derive power or influence from traditional claims associated with lineage. Further, the traditional leaders derive power from the constitution of Zimbabwe as provided for by the Traditional Leaders Act.

Responses by the traditional leadership relates to collective enforcement of resource use rules and use of authority to enforce compliance. For instance, in Murehwa, a local Headman narrated a long list of purported measures they have put in place to enable villagers and wetland users to fight or mitigate climate impacts on wetland livelihoods.

For the headman in Murehwa, villagers are no longer allowed to cut down trees near wetlands. There are numerous cases where meetings are called in order to remind villagers to practise good land husbandry methods which include upholding and respecting 'sacred' sites such as water grooves not using sanctioned equipment such as metallic cups and dishes to fetch water from wetland springs. Wife to Chief Seke weighed in heavily on the above observation. She reiterated that no villagers are allowed to go to wetlands on a Chisi day. Furthermore, dry land crops are no longer allowed to be grown in wetlands and that no construction of houses will be condoned in wetland areas. All trees which are considered sacred, such as *mukute (Syzgium Cordatum) and muhacha (parinari curatellifolia*) are not supposed to be cut from wetlands.

To this end, prospects of embracing IKS as a set of management practices were explored to enhance wetland livelihoods. Table 1 below summarizes wetland related IKS responses obtained from the three case studies.

Table 1 Wetland Related IKS Potentials to Respond to Climate Change Impacts on Wetlands

IKS parameter	**Measures related to the Parameter**
Technical Methods	• Growing water retaining plants • Restricting use of metal vessels to fetch water from wetlands • Non extraction of trees from wetland areas. • Barring drilling boreholes in wetlands. • Wetlands not to be used for livestock grazing.
Institutional Controls	• Use of Chisi. • Respect Chiefs laws on land-use. • Punishment for wetland user rules. • Restricting access to wetland grooves • Barring construction on wetlands. • Barring some crops from wetlands.
Religious Control	• Brewing beer for *chipwa* to appease spirits • Sacred status of wetlands • Sacred wetland animals such as snakes • Some springs and pools are regarded as sacrosanct. • Sacred wetland trees eg *Syzgium Cordatum*

Source: Field FGDs and KII. (2019; 2020)

V. DISCUSSION

Risiro et al. (2013) and Chanza, 2015 have noted that IKS data is qualitative in nature. IKS collected data ranged from views, practices, perceptions and beliefs, was organised according to themes and emerging meanings. Further, in discussing this study outputs, attention had to be given to remain judicious to the objectives of the study, communities from which the information was generated whilst yielding conclusions which speak to the scientific community. To this end, three domains of themes emerged and discussed herein.

➢ *Technical Strategies*

Indigenous Knowledge Systems use technical skills in management of wetlands. Technical wisdom relates to practical conservation and management strategies which are heavily embedded in the traditional societies. Technical methods such as barring some equipment from fetching water for wetlands such as metal containers and drilling boreholes are some of the relevant examples.

A closer look at the technical methods reveals numerous reasons. Trees which were reserved and protected around wetlands are keystone species which have ecological roles in sustaining water storage and conservation. Restriction of boreholes and livestock grazing in wetlands was upon realisation of unsustainable rates of water abstraction likely to result from these activities. In the case of livestock grazing, the desiccation and destruction of the water-logging and spongy effect are likely to emerge. There were specific crops mandated to be grown in wetlands such as rice, sugar cane, early maize and tsenza (*plectranthus esculentus*). Besides being water loving crops which would retain water, such crops were also able to balance and enhance the ecology typical of wetlands.

Water harvesting from wetlands had to be done using specified and locally accepted vessels. Metal objects and cups are not permissible to fetch water from wetlands. This practise had a conservation merit. Traditional vessels are usually small as compared to the modern and metal containers. Even use of pipes and irrigation equipment is not permissible in wetlands as water harvesting methods. A closer look at these gadgets will reveal that these will fast drain water more than the rate of natural replacement. True to the ideology, this was a conservation ethic and practice as well as safeguard the natural sanctity of wetlands.

Technical forms of IKS discovered in the study show some confluence with other findings. Some scholars noted that wetlands were also associated with protection of native trees such as *cordatum syzygium* (mukute) to preserve springs and sponges (Manyanhaire and Chitura, 2015). Chanza (2015) in his studies in Muzarabani discovered a wide array of indigenous practices which were earmarked to protect, manage and sustain resources such as wetlands (rivers, pools, and springs). Such practices included restrictions on use of foreign and metallic containers and preserving witness tree species in such areas.

A closer consideration of the technical ways of managing wetlands seems to reflect three issues. Firstly, restrictions on use metals suggest the need to observe and respect natural replenishment of water through natural recharge. If metallic objects were used, this was likely to cause drying up of wetlands. Secondly, preservation of some trees based on an ecological principle of ‘‘keystone species’’. Key stone species such as *cordatum syzygium* helped retain water resources. In the third instance, discouraging some activities and crops in wetland areas was an acknowledgement of sensitivity and fragility of nature of wetlands which influenced their carrying capacity. To buttress this technical wisdom, IKS uses institutional means also to manage wetlands.

➢ *Traditional/ Indigenous Institutional Controls*

Indigenous Knowledge Systems works closely with traditional institutions in managing wetlands. Such institutional controls range from user rules, access stipulations, distribution and wetland allocation patterns, water use arrangements and penalties on offending and breaching parties in the communities. Apparently, the traditional structures espouse the same as they have the powers to enforce and regulate the resource management rules and regulations (Chisi, 2015).

Several factors and reasons account for the institutional controls. The user rules help to contain and regulate user behaviour. The user rules are also points of convergence which will provide a rallying point for communities. Besides relating to wetlands use, the institutional controls are intended to identify powers which will preside over conflicts in case such social processes arise. The adherence and enforcement of all these institutional instruments is the mandate and responsibility of the chief or local headman.

Traditional leaders' control also largely depended on enforcement of some restrictive rules. In this case, traditional leaders are supposed to set demarcations near wetlands beyond which interference is not permissible. This takes several forms such as: reducing visits to wetlands and sanctioning visits on wetland grooves, restricting building in or near wetlands, banning of burning of crop residues in wetlands, barring collection of dead wood from wetlands and ensuring that non-metallic gadgets are used in collection of water from wetlands and pools.

In some congruence to the above, Murphree (1991) notes and contend that communities devise rules of access to resources such as wetlands. Such rules which have the effect of sustaining the resource include specifying resource users, the boundaries and how the resource should be used

Above all, traditional institutions have powers to mete out severe punishment on offenders or found violators. The traditional institutions have mandate and powers to effect and ensure adherence to the laid down and institutionalised laws. A closer look at institutional methods indicate that these are ways of effecting collective will and foster principles of common property management systems as espoused by the Common Property Theory (Bromley 1989; Ostrom 1990; Murphree 1991; McKean, 1992; Mulvaney and Robbins, 2011; Lawry 1990, 2014; Topal 2015). However, results obtained in Seke site differed with this wisdom. The arrival of immigrants and weakening of traditional leaders is causing conflicts and abandonment of traditional institutional means of effecting IKS as a management package. Further to the institutional controls, IKS also employs religious wisdom to manage wetlands.

- *Religious Controls*

Religious forms of control hinge on the use of beliefs which are part and parcel of a given community. These control forms include beliefs in spirit mediums, adherence to ceremonies which are meant to appease ancestral powers whose influence over land cannot be breached or abhorred. In addition to the above, some resources such as water grooves, trees, animals and pools are regarded as sacred.

Religious forms of resource control have been founded on diverse backgrounds. Sacred animals such as the black mamba snake, referred to in Murehwa is intended to curtail human disruption and mismanagement of wetlands. Sacred pools, grooves and springs are protected from human abuse and interactions. Religious controls border on appealing to supernatural powers. Through deep rooted socialization of community members, conformity and control are easier to effect. Respect for common religious practices is fundamental to achieve adherence. This explains why loss of traditional religious values is often blamed for the demise of some resources (Risiro et al. 2013; Chanza, 2015). Religious wisdom in resource management invokes and embraces elements of 'ecospirit' controls which adores and respects blossoming of life in its diverse forms.

Religious control also assumes an institutional role. Ceremonies and rites to appease land spirits were coordinated under the guidance and tutelage of the traditional leaders related spirit mediums to ensure compliance by community members. The philosophy behind these ceremonies is that the wetlands and other resources will sustain livelihoods and guarantee the villagers of goods harvests from the wetlands. This philosophy is termed *kincentric ecology* by other scholars (Clifton, 2009 in Chanza 2015). Such ceremonies will appeal to the land spirits (*midzimu yenzvimbo*) to protect their livelihood sources such as wetlands, water, fields and wildlife.

The above analysis has been confirmed also by other scholars. Cultural beliefs, rituals, regarding some headwaters as sacred as well as use of spiritual-related sanctions were employed as means of management of wetlands (Gadzirayi et al. 2006). Mukamuri (1995) notes how communities devise religious norms and values to protect the integrity of resources. Community leaders often invoke religion and rituals to exercise control over resources such as wetlands as well as the users (Dzingirai & Bourdillon, 1998; Gadzirayi et al. 2006)

Critical scrutiny of the IKS discourse reveals an instrumental local philosophy in resource management. IKS is like a tool box. When a resource is under threat from whatever form, IKS has technical, institutional, religious and sacrosanct methods of sustaining the resources. Nonetheless, the effectiveness of IKS in the three study sites is a debatable but needs further assessment, as variations from site to site were exposed.

A closer look at IKS reveals the importance of grassroots initiatives in sustaining livelihoods. IKS bestows the local communities with space and application of local knowledge in solving local challenges (Risiro et al. 2013). What is inherently embedded in IKS is a multi-pronged approach which encapsulates practices, institutional structures and religious philosophy in aiding communities in dealing with environmental calamities threatening their livelihoods, climate change included. IKS as a package of managing livelihoods is critical as it is a foundation for incorporation of local wisdom as it is a pool of knowledge amenable to any context. For Bromley (1989) and Topal (2015), rural people are capable of organising themselves in ways that ensure the sustainability of natural resources.

VI. CONCLUSIONS

Wetland livelihoods and management are research avenues which reveal substantial local community environmental wisdom and changes of the same over time. Changes in wetlands over time have been perceived from *kinocentric* lens. Decline in wetland sizes, water levels, changes in wetland vegetation and drying up of some support systems like springs have all been interpreted from local knowledge wisdom.

Further to the above, local environmental wisdom is often called upon and harnessed to deal with environmental shocks such as climate change. For the most part respondents reminisce olden days in which IKS was the guiding environmental management pogrom and dogma. In this space and spirit, communities perceive IKS as able to revive wetlands as well as related livelihoods. For the communities, IKS can predict climate change calamities, restore wetlands, adapt livelihoods and mitigate impacts of climate change.

Indigenous Knowledge Systems has potential to enable local communities revive wetland livelihoods under certain conditions. Besides restoring the institutional, religious and technical residues, the same package has merits and strengths in being compatible with modern scientific practices. There is greater scope if the value and knowledge systems are revisited and appraised. However, field evidence is indicating that communities are hardly putting IKS into practise but largely hopeful that is vital in restoring wetlands.

Albeit the potentialities associated with IKS as a management package for wetlands in dire scenarios, the influence of other factors need further exploration. Although communities are blaming climate change for the wetland degradation and shrinkage, the anthropogenic impacts cannot be ignored. Such human impacts range from increase in population and its attendant ramifications such as settlement expansion, crop farming, livestock grazing and general over abstraction of water among other issues.

In the final analysis, potentiated links between IKS and wetland management seems to be about understanding context specific and holistic resource use practices which need to be customized to diverse environments. This paper is arguing that the incorporation of local management practices which have withstood the test of time is essential to empower local communities and deserve space in responding to climate change.

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