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Research Article

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ABSTRACT

Sustainable livelihoods based on wetland resources have proven to be very delicate. As a wetland ecosystem degrades, the livelihoods of most rural poor people deteriorate. This study assessed the livelihood challenges that the Chingombe community of Gutu district, Masvingo, Zimbabwe, encountered following the drying up of Mutubuki wetland. A total of 26 household heads and 6 key informants were directly involved as questionnaire respondents, interviewees, focus group discussion participants and subjects directly observed. Following the drying up of Mutubuki wetland, the range, quantities and quality of functions and products the ecosystem provided to the local population significantly declined. The degradation of the wetland significantly influenced the dwindling of livelihood options available to local households and worsened the plight of the rural poor. The residents experienced food insecurity, malnutrition, water shortages mostly during the dry season, income loss among other survival challenges. Engendering partnerships, coupled with national wetland policy realignment with wetland wise use would enhance opportunities for local community survival beyond wetland loss and degradation.

Keywords: wetland loss, wetland degradation, wetland livelihoods, wetland benefits, dryland wetland ecosystem, Mutubuki wetland.

INTRODUCTION

Wetlands are a critical part of our natural environment and provide an important range of ecological, socio-economic goods and services vital for environmental integrity and human wellbeing. The utilisation of wetland resources for human development has received opposing responses especially given the phenomena of increased human poverty, wetland degradation and persistent dry weather (Finlayson, 2006; Ndiyo and Wood, 2008). Wetland resources are recognised as interests vital to local communities, ecologists and natural resources protection agencies. Wetlands, being among the most productive ecosystems on the planet, provide numerous products, services, functions and multiple benefits. The Ramsar Convention on Wetlands recognises the interdependence of humans and wetlands and the irreplaceable resources they provide to society (Taylor et al., 1995; Breen et al., 1997; www.ramsar.org). These benefits, derived from wetland ecosystem services, are unique, varied and extend across many sectors, but their contribution and livelihood values are not always fully and accurately captured in wetland management decision-making (Alexander and McInnes, 2012).

Wetlands are areas where water is at, near, or above the surface of the ground often enough for hydric soils to form and/or for wetland plants to grow. The wet conditions make wetlands the most biologically productive ecosystems. Globally, wetland ecosystem resources are threatened by uncontrolled and unsustainable human utilisation activities, drying weather and changing values and attitudes by local communities. As they are utilised, there is a greater danger that some wetland resources are being degraded and/or depleted. Indeed wetlands are among the endangered natural habitats and they have been destroyed by human beings because they are ecologically fragile (Thawe, 2008). Most wetlands already have been destroyed

or severely degraded, largely due to human activities such as road construction, agriculture, non-point pollution sources (including highway and pesticide run-off), land development, dredging, and antiquated mosquito control methods (Nhandara et al., 2001). Botkin and Keller (2000) observed that perhaps as much as 90% of the fresh water wetlands have disappeared. As the wetland ecosystem is degraded, also eroded are sustainable livelihoods for many poor and vulnerable local residents. However, there has been limited research on the extent and magnitude of survival threats introduced by localised wetland loss and degradation, especially to the rural poor with very limited feasible livelihood options (www.ramsar.org; Mukaro, 2012; Ndiyoi and Wood, 2008).

In the last few decades, scientists have discovered that wetlands have tremendous ecological and socioeconomic value. As a result of this great realisation, ways to farm and carry out varied development activities and control of mosquitoes without destruction of wetlands have been advocated for. Southern Africa Development Community (SADC) and The World Conservation Union (IUNC) in their Wetland Conservation Programme for Southern Africa recommended the protection of wetlands (Chenje et al., 1998). In 1971 countries came together to address the loss of wetlands in the Iranian city of Ramsar. The Convention on Wetlands' broad aims were to halt the loss of wetlands and raising awareness about the important role that wetlands play in our daily lives and survival of humankind in general to enhance their wise use (Mukaro, 2012, www.ramsar.org). Interestingly, following the Ramsar Convention of 1971, wetlands are becoming increasingly valued and used wisely due to increased awareness of their functions and benefits, but in most parts of the world, some local populations are still ignorant about them (Cunningham and Saigo, 1996). Some local residents may not be informed about wetland livelihood values hence may need knowledge and awareness. Wetlands should be conserved and used wisely since they are the means of survival for poor rural communities during dry spells and seasons. The SADC in 1991 formed the Wetlands Conservation Programme following the Ramsar Convention (W'o.OKOT-UMA, 2000). The Environmental Management Act of Zimbabwe (CAP 20:27 of 2002), Part XII, Section 113, subsection (2), advocates for the protection and conservation of wetlands in the country and prohibits activities that may degrade wetland resources. Communities also have local wetlands protection bylaws, which are administered by local and traditional authorities. However, cultural wetland protection is poorly documented maybe they lack proven record of success rate in curbing wetland loss and degradation.

It is quite some notable phenomenon that some local communities tapping on the wetland resources have formed wetland management teams to ensure prolonged wetland wise use and livelihoods sustainability. This development was after noticing the high local community dependence on wetland resources but low involvement in their management. The management teams often receive technical training either from local authorities, locally based non-governmental organisations (NGOS), central government departments entrusted with environmental protection or some voluntary groups with some environmental protection bias. It is by this effort towards a coordinated approach to wetland ecosystem management that it is hoped both wetland health and community well being would be maintained and prolonged indefinitely. This study however, is wary of the limited literature on the dire consequences and alternative livelihood options for local people following loss and degradation of dry land wetland ecosystems.

When a wetland is degraded, ending up completely dry, it becomes a cause for concern for most stakeholders. Wetland loss is the loss of wetland area, due to the conversion of wetland to non-wetland areas, as a result of human activity, while wetland degradation is the impairment of wetland functions as a result of human activity (Moser et al., 1998). The commitments and obligations under the Ramsar Convention clearly mandate wise use and the avoidance of wetland loss and degradation in the first instance (Alexandar and McInnes, 2012). The Ramsar Convention was established to address issues of the loss and degradation of global wetlands, so that wetlands could contribute to sustainable development. The World Wide Fund (WWF) estimates using data from the Ramsar Convention that about half of the world's wetlands have been lost since the 1900s, causing a loss of economic wealth globally (www.wetlandsalberta.ca). The recently completed Millennium Ecosystem Assessment, the most thorough examination ever undertaken of the health of planet's ecosystems, points out that the continued loss of wetlands will further reduce human health and wellbeing, especially for the poor (Wetlands and Water, 2006). Different wetlands provide a range of valuable services according to their type, size and location. Most researchers do not set themselves to assess the relative dependency of poor local communities on wetland provisioning services (Lannas and Turpie, 2009). Quite often, these wetland values are underestimated public benefits, given low priority and are seldom recorded. When wetlands are degraded, the broad range of benefits they produce begin to deteriorate and eventually vanish. This seriously affects the households directly dependent on the wide range of the wetland ecosystems' public goods and services. Wetland resources and services are often particularly important to poorer and more vulnerable households, who lack alternative sources of income and subsistence and have weak access to basic services (Lopez et al., 2008).

Wetland degradation and loss poses a severe threat to both development and conservation goals, and impacts disproportionately on some of the world's poorest communities. The degradation and loss of a dry land wetland influences economic returns of wetland related activities and ultimately livelihoods options of local poor people. The Chingombe rural community, the subject of this study, has relied on the public goods and services of the historical Mutubuki wetland ecosystem since time immemorial. Mutubuki wetland is a small, localised but valuable natural resource amid a largely terrestrial ecosystem. This is a wetland of national importance as recognised by the Environmental Management Agency, the Gutu District Council and local traditional and political

leaderships. Throughout history, this wetland has been integral to the survival and development of the Chingombe community. Wetland livelihoods are characterised by the use of a wide range of resources; their viability and sustainability relies upon this availability and the ability to convert these resources into livelihood outcomes (Lopez et al., 2008, Jogo et al. 2008). However, following the introduction of modern scientific management practices, more specifically, the relocation of gardens from within the wetland perimeter and the subsequent fencing-off of the core wetland area in 2001, water flow and moisture regime were widely expected to improve. This was however short lived as the wetland dried up starting 2006, and becoming more severe and realistic in 2009. It was this sudden turn of the fortunes which has surprised most concerned stakeholders as this has never occurred on this wetland ever since people can afford to recall. This study therefore seeks to investigate the impacts and implications of this state of the wetland on the livelihood options of local residents. The findings of this enquiry should inform policy on wetland conservation and restoration as well as hint on alternative sources of livelihood to the local community.

This study assessed the impacts and implications of the loss and degradation of Mutubuki wetland on the livelihoods of the rural poor residents. In order to meet this aim, the following specific objectives were pursued: First, to explore livelihood resources derived by the Chingombe community from the wetland ecosystem (past and present), second to examine the adverse impacts of the drying up of the wetland on local livelihoods and lastly to propose sustainable livelihood options for the affected community. The following questions were answered as the study sought to meet its defined objectives: Historically, what goods and services did the local residents get from Mutubuki wetland ecosystem? What livelihood resources are local people currently getting from the wetland ecosystem? What significant livelihood challenges have been presented to the local community as a result of the present state of the wetland? Which alternative livelihood options are viable and feasible to the local residents? How sustainable are the alternative livelihoods? What policy reforms are necessary to exterminate the negative impacts of management interventions on local livelihoods? The search for answers to these and other salient questions directed this study to some conclusive end.

Description of the Study area

The study was carried out in Gutu District, Ward 36, Chingombe community comprising five villages (namely Mutubuki, Mudhefi, Njerere, Bote and Mushwayi) and over 92 households (Figure 1).

Figure 1: Map of the Study Area

This is a rural community dwelled by mainly peasant dry land farmers (cultivating mainly drought resistant crops and rearing of some livestock). The five villages are made up of one ethnic group, the Karanga people of the Gumbo-Madyira totem, a dialect group of the Shona people of Masvingo Province. Ecologically and hydrologically, this is a semi-arid area (receives less than 450 mm annual rainfall) (Munowenyu and Murray 1990, Chikodzi et al 2012) hence supports sparse savannah vegetation and is drained by ephemeral streams. Economic activities are limited and the population is made up largely of poor agriculturalists that are far away from markets and other modern economy amenities. Most of the community's socio-economic activities, for decades now, were based on the Mutubuki wetland ecosystem. Chingombe primary and secondary schools provide the basic educational needs of this community. A service centre is the main source of low order industrial products but nonetheless supplies other vital functions but medical facilities. There is a gravel road linking this community with Mpandawana Growth Point (the nearest major market), some 60 km away to the west. Water resources are a big challenge in the area. There are only two boreholes serving the village, the two schools and the service centre. Mutubuki dry land wetland system used to provide much water for garden irrigation, livestock

watering and domestic purposes. However, the deteriorating wetness status of the wetland has further multiplied the water woes of the Chingombe community given the conspicuous absence of perennial rivers or streams and dams.

MATERIALS AND METHODS

The study carried out a household heads questionnaire survey during the period November 27 – 30, 2012. A total of 26 Questionnaire sets for household heads was administered. The questionnaire data was corroborated with data from 6 Interview Schedules for Key Informants (EMA District Officer, CEO Gutu Rural District Council, Ward 36 Councillor Councilor, Chairperson Mutubuki Integrated Project, Local AREX officer, Local Chief). The research team undertook 4 Direct Observation Schedules and Recording Sheets were used to store the observed data. A digital camera was used to take photographs of some relevant phenomena in the study area that could be used to support some observations. A Hand-held Global Positioning System was for taking coordinates of the wetland site and garden dimensions. A focus group discussion guide for in depth participatory research surveys was designed and the discussions were held on 29 November 2012 at the project site. Microsoft Excel and Statistical Package for Social Scientist (SPSS) were used for statistical data analysis to reveal data trends and patterns. A pilot baseline survey was carried out in June 2011 to familiarise with the area and identify key variables and subjects of study. A questionnaire survey for 26 project members and their fellow villagers was administered from November 27 – 30, 2012. Stratified random sampling was used to select the participants. First villagers were grouped according to villages of origin to achieve spatial representativeness. In each village, villagers were grouped as either project members or non-members. Randomly, 26 questionnaire respondents were proportionately selected from the five villages to achieve a balance between project members and non-members. During the same period, interviews with key informants, namely the local chief, Ward Councilor, Project management team leaders (2 members) and Agritex officer, were carried out. A focus group discussion with 20 project members gave the research team an opportunity for participants to raise and debate issues freely and allowed follow up questions to be probed. Ecological and livelihoods surveys (Direct field observations) were carried out concurrently with questionnaire and interviews administration to corroborate the data collected by the other tools. Photography was incorporated to aid in capturing scenes as they appear and/or unfolded in order to aid explanations and analysis. Remote sensing and Geographic Information Systems (GIS) facilitated spatial analysis, study area map generation and calculations of wetland perimeter and area, areas of the community garden and gum plantations. The collected data were analysed using SPSS and Microsoft Excel to allow for statistical and graphic data presentation and analysis.

Study Results

The Chingombe community of Gutu district in rural southeast Zimbabwe has heavily relied on goods and services provided by a dryland wetland ecosystem (bani/defe in local language) which they have affectionately named Mutubuki Wetland (after their influential tribal ancestor). Following in-depth participatory research surveys that involved interviews with key informants, questionnaire surveys and a focus group discussion, this study established that some of the oldest surviving residents were born in the 1920s and they have narrated how their families' livelihoods have been highly dependent on the wetland ecosystem. The Mutubuki wetland has mainly provided provisioning (gardening, forage and raw materials collection) and cultural services (biodiversity protection, aesthetic value) as direct benefits while regulatory and support services have been indirect benefits to the Chingombe community. After realising the key roles played by the wetland to the well-being of the local community, and partnered by the National Action Plan (NAP), United Nations Development Programme (UNDP), the Environmental Management Agency (EMA) (the then Natural Resources Board (NRB)) and the educated sons and daughters from the local community, a Consolidated Chitenderano-Mutubuki Wetland Management Project was conceived. The consolidated project had five components (Table 1).

Table 1: Components of the Consolidated Chitenderano-Mutubuki Wetland Management Project

Project Component	Sub-components	Milestones
1. The Environment Component	a) Wetland Protection and Utilisation b) Honey Production c) Fodder Production d) Gully Reclamation e) Gum Plantation f) Biogas Production and Utilisation	- wetland perimeter fenced off in 2000. - 20 beneficiaries, each with 10 hives - 6 sites successfully reclaimed - 1.8 hectares of gum plantations - 2 functional biogas digesters
2. Livestock Related Component	- Pass on the Gift	- 90 heifers and 4 bulls in 2002
3. The Energy Related Component	- Participation in the national Rural Electrification Programme	- 25 households successfully electrified their homesteads in 2002.
4. Health Related Component	- Construction of a clinic	- brick moulding, trenching and footing the foundations in 2007.
5. Water Usage Related Component	- Consolidated community garden - Weir construction - Trenching to collect water from wetland - Enhancing aquaculture development	- 56 households are cultivating the garden - trenches have been dug - a weir constructed on the downstream side.

(Source: The Consolidated Mutubuki-Chitenderano Wetland Management Project Report, 2012)

In spite of being the chief natural resource, a reliable source of livelihoods for the local community, and having a sustainable wetland management project in place, Mutubuki wetland is now in a degraded state, it has dried up. The wetland's rate of drying up accelerated in 2005 to date. This has been widely confirmed by the project and non-project community members, the traditional and political leaderships and the environmental agency official based in the district. Figure 2 shows the scores (0 – 10) awarded by focus group discussion members as they rated the moisture regimes of Mutubuki wetland during the decades between 1960 and 2010. A score of 10 means very high incidences of moisture, with surface water on the wetland lasting all year round, while a score of 0 means very low moisture, with no surface water even during the wet season. The year 1960, in this case, is the baseline for status and trends reports.

Figure 2: Moisture Regime Trend in the Mutubuki Wetland.

Questionnaire respondents confirmed the above trend as 65.4% described the drying up of the wetland as having precipitated in 2006.

The Mutubuki wetland ecosystem has sustained livelihoods for the rural households in this semi-arid region of southern Zimbabwe. People around it have had a long and intimate association with the wetland and have derived ecological and socio-economic products that have allowed them to earn a sustainable living. It is quite apparent from Figure 3 that the local population has derived some livelihoods benefits from the wetland as it summarises some of its major uses.

Figure 3: Mutubuki Wetland Ecosystem Livelihood Benefits.

However, following the marked decline in moisture in the wetland, the benefits derived from the wetland ecosystem have subsequently and significantly dwindled. The participants in this study unanimously echoed the fact that as the moisture regime worsened, so did their socio-economic wellbeing and environmental integrity.

The degradation of a once highly productive wetland ecosystem has profound social and economic repercussions for people dependent on its ecosystem services. Now eking out a living from a visibly degraded wetland ecosystem, the Chingombe community suddenly finds itself confronted with myriad subsistence challenges and limited alternative livelihood opportunities (Figure 4).

Figure 4: Challenges Encountered by Population Following Wetland Degradation.

The wetland has been the main source of livelihoods and environmental integrity and in its absence, alternative livelihoods are extremely limited and residents are not very confident in any one of them (Figure 5).

Figure 5: Alternative Livelihoods for the Households.

However, life for these households and the community at large has to, nonetheless, continue. The collective responsibility therefore, is for these people to be creative, think and dig deeper to explore new viable and/or feasible livelihoods that have realistic potential to sustain their needs and uplift their wellbeing. The research subjects offered some strategies they hope would mitigate some consequences of the degraded wetland and at least help keep them aloft (Table 2).

Table 2: Strategies to Mitigate and Sustain Rural Livelihoods Following a Degraded Wetland

Strategy	Implementation logistics	Livelihood Outcome
a) Forging partnerships with some developmental agents	Work together with public, private and voluntary agents	Strengthened action programmes
b) Harmonised traditional and scientific methodologies of wetland monitoring and evaluation	Conservation and poverty reduction in wetlands framework	Good social relations
c) Increased wetland education, awareness and level of wetland conservation actions	Wetland education, awareness and training programmes for the community	Freedom and Choice, Empowerment
d) Rehabilitation and restoration efforts that integrate wetland conservation and poverty alleviation	Use resource persons with technical indigenous and/or scientific knowledge	Necessary materials for good life
e) Policy reforms incorporating a measurable goal on wetland degradation	Stakeholder participation in the National Wetland Policy making process	Access, equity, security, benefit sharing, good governance

(Source: Research data, 2012)

DISCUSSION

The study confirmed that the poor base their livelihoods on ecosystem services (Kotze et al., 1995; Moser et al., 1998; Emerton, 2005). The residents readily identified provisioning and cultural services as the main benefits derived from the wetland. This demonstrates that assessment of wetland value by local communities is based on contribution towards family sustenance and livelihood. The project members used to get numerous services from the wetland, ranging from source of water for garden irrigation, domestic use and livestock watering. Also food security was ensured through cultivation of leafy, fruity and roots vegetables and a variety of wild fruits that promoted a healthy diet for the community. The vegetables were marketed locally and earned gardeners valuable income that households used to finance education and health care services, farm inputs and implements and

their general welfare. Therefore, wetlands provide food for local populations and is a major source of income and support important economic activities thus creating a link between economics and natural resources (Ndeti, 2006). Some were so prudent that they recognised the aesthetic value of the wetland; they considered the site as a recreational place. However, when it comes to regulating and support services of the Mutubuki wetland, most villagers and traditional leaders were mum, suggesting little value attached to these. Wetlands roles as gene banks for biodiversity conservation, sponges for ground water recharge and flood mitigation, micro-climate regulation, were not highly rated. Such an outlook is influenced by societal wellbeing; the poor always prioritise material satisfaction before they turn to environmental protection concerns (Frenken and Mharapara 2002).

The loss and degradation of wetlands has severe economic consequences, and removes opportunities for sustainable development (Moser et al., 1998). This submission is a correct reflection of the events unfolding in Chingombe community following the drying up of Mutubuki wetland. The loss and degradation of wetlands reduces their ability to provide goods and services to humankind and to support biodiversity, and are therefore associated with economic costs (Moser et al., 1998). The households mourned income loss from the marketing of garden produce. The numbers of vegetable beds allocated to each of the 56 households in the consolidated garden were reduced from 11 to only 2 in response to water scarcity and stress. Malnutrition is now a health problem for both humans and livestock following reduced garden yields, not enough for the farming families, let alone the other residents. The lush grasses that used to be harvested as livestock forage has been lost too. The drying up of wetlands undermines the ability to provide vital services for local communities and ultimately leading to further and deepening poverty especially for wetland-dependent, marginalised and vulnerable people. When wetlands undergo changes in status or management regime, this can have major knock-on effects on the livelihoods of local communities (Emerton, 2005, Adekola 2007). Socially, time for leisure is lost as people spend time queuing at water sources to fetch water. Project members have divided themselves into 2 groups of 28 households and have staggered watering days in response to the low water discharge from the well they dug at what used to be the core of the wetland. Each vegetable bed now gets 6, 20 litres buckets of water following rationing of irrigation water. Such amounts do not suffice given the high evapotranspiration rates experienced in the area. This confirms observations by Kotze et al. (1995) that the consequences of wetland loss and degradation are likely to be more severe in arid and semi-arid countries because of the scarcity of wetland resources. Portable water is got from distant boreholes (about 6 km away) and long queues are endured to get a turn to fill up one's water containers. Fortunately, because of the fine social fibre within the Chingombe community, water conflicts are minimal. The Ramsar Convention notes that access to freshwater is declining for 1-2 billion people worldwide, and this in turn negatively affects food production, human health, and economic development, and it can increase societal conflict (www.ramsar.org).

Losses of wetlands in developing countries are likely to have a more direct impact than in richer countries, because mitigatory measures are less likely to be implemented due to financial and technical constraints (Moser et al., 1998). The Chingombe community realised that in the absence of a healthy wetland ecosystem, their wellbeing as a people was greatly compromised. It is by considering the alternative livelihoods suggested by the subjects of this study that one notes lack of confidence in any one of them. The clear message this sends is that, for a community once heavily dependent on some wetland resources, shifting livelihoods elsewhere is not a stroll in the park. Growing drought resistant crops and rearing drought resistant livestock breeds were lowly rated as alternatives. The Ramsar Convention again notes that degradation and loss of wetlands make climate change worse and leave people more vulnerable to climate change impacts such as floods, droughts and famine (www.ramsar.org). It was noted that in the absence of a dependable water source, then cropping and livestock rearing are futile pursuits. Exploring ground water, drilling deep boreholes (over 100 metres deep), erecting large reservoirs and investing in irrigation agriculture are possible options. However, thorough groundwater explorations would be required to ascertain viability of this option. Pursuing livelihoods outside agriculture was another option deemed good enough to restore community wellbeing. The consolidated Mutubuki-Chitenderano Wetland Project has provisions for gum plantations (1.9 hectares is currently under the eucalyptus grandis), honey production and aquaculture. Also, quickly suggested was making use of the available hydro-electrical power to start backyard cottage industries like welding, tailoring, and trading in cheap quality merchandise. Again, it was noted that in the absence of reliable perennial water supply source, these efforts would amount to naught.

Eventually, the study sought to chart the way forward for the Chingombe community after noting that restoration and rehabilitation measures could be expensive and out of reach, and unlikely to restore full wetland natural functions. It was clear that left on their own, the local people have limited potential to spring any sustainable livelihood alternative. The first strategy suggested in this study is the forging of partnerships with all pro-development agents, public, private or non-profit making, and voluntary humanitarian groups. This approach yields a hybrid of ideas, pools resources from various sources, and it's multi-sectoral and all encompassing. It is greatly hoped that such an approach would breed some valuable developmental programmes meant to attain set goals. Integrating technical indigenous and scientific knowledge systems is again expected to harmonise wetland conservation and management efforts and foster responsibility at different relevant levels. It is through this effort that options for interventions to maintain sustainable links between wetland ecosystem services and human livelihoods would be successfully identified. This ensures security of the benefits that wetlands bring to guarantee

human wellbeing. Wetlands make an important contribution to economic and environmental security (Emerton, 2005). The national wetland policy should involve stakeholder participation at all stages of the policy process. This guarantees capturing and incorporation of most useful ideas to raise the quality of rational decision making at all levels of natural resources utilisation while ensuring sustainability.

CONCLUSION

The study assessed the environmental costs of loss and degradation of a dry land wetland ecosystem on sustainable livelihoods of some local rural population. Specifically, the study identified and analysed the livelihood challenges faced by poor households who formerly and heavily depended on the resources of a natural wetland ecosystem. Wetland degradation is synonymous with rural livelihoods erosion, especially for rural communities in dry areas and directly bearing the brand of climate change. Wetland benefits are completely lost and community innovativeness is often not good enough to bring sustainable livelihood options. Water scarcity and stress is unselective, the water woes spread evenly and/or uniformly across the breadth and width of a local rural community. This often compels communities to unite and collectively face the challenges duly presented. The study therefore concludes that wetland wise use is mandatory if humankind is to continue deriving sustenance from wetland ecosystems and authorities need to build and enhance shock-resilient communities.

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