Exploiting indigenous knowledge commonwealth to mitigate disasters: from the archives of vulnerable communities in Zimbabwe

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This research explored the relationship between vulnerability and the use of indigenous knowledge in mitigating disasters particularly those linked to food security and preservation of forest resources in some communities in Zimbabwe. This focus on provision of food was important since food issues have an immediate impact on communities and for vulnerable communities forest resources are also linked to food security. Data was collected through both formal and informal interviews, and group discussions with the elderly and traditional leaders in Matebeleland and Mashonaland provinces of Zimbabwe, hence a qualitative research approach was used. Although the findings are unique to the communities involved, it is important to note that vulnerable communities do possess a wide range of indigenous measures to mitigate disaster risk. Firstly, it is the realisation that technology does not necessarily refer to modern or objective science, but solutions that lead to sustainable livelihoods for local communities, which include environmentally based early warning signs which allow them to take precautions before a disaster like drought, flood, pests, etc., occurs as well as measures to reduce the impact of such a disaster. Secondly, production, harvesting and conservation have always been inbuilt in the farming techniques of these rural communities and mushrooms that form a regular part of the diet and provide protein for rural communities are a good example. Since time immemorial they have always been preserved within their natural habitats and women who have always been able to distinguish edible mushrooms from toxic ones have always known how to stimulate their growth by applying crop waste or ash as fertilizers to the ground on which they grow. Lastly it is natural for some indigenous techniques to lie dormant as if they are extinct. This is because every generation makes its own contribution to improvise and adapt the knowledge system in line with the ever changing climatic conditions. The article recommends that since the proportion of non-sustainable practices in traditional knowledge systems is much smaller than the benefits accrued through its use in the contemporary modern life and belief systems, there should be development, use and adaption of technologies that have links with indigenous knowledge systems. Developing contextually relevant educational processes that identify and build upon local knowledge and expertise for disaster risk reduction is needed and where possible, expressed in local language and context. In short vulnerable villagers should have more legitimate authority over natural resources for they are more responsive than local government authorities.

Keywords: Indigenous Knowledge, Technology, Disaster mitigation, Disaster risk reduction, Zimbabwe

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Humanity has always relied on technology to live comfortably. Yet technology is relative in time and space, ranging from chipped stone implements of the early human beings to complex modern machinery. Indigenous knowledge technologies are still abundant, although in the African context they have long been ignored and marginalised by the western world. Often enough indigenous knowledge (IK) has been referred to as primitive, simple and static. Risiro supports this assertion indicating that the current tragedy is that most people have tended to absorb one form of knowledge, specifically western knowledge, at the expense of local or indigenous knowledge. Yet IK in many cases was developed in response to localised disasters and such knowledge was meant to contain or mitigate such problems. Communities that have completely discarded IK have often found themselves vulnerable to natural disasters. Zimbabwe has had its own share of disasters in the form of severe droughts and flooding in some areas where in the past no such events occurred. In Muzarabani (Mashonaland Central province) and Sipepa (Matabeleland South province), droughts, insect infestations and flooding have become more frequent and therefore the use of IK has become more apparent and necessary. Thus the objective of this research, which took place

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between January 2012 and November 2013, was to determine the use and relevance of indigenous methods of disaster risk reduction in Zimbabwe, with reference to selected districts: Guruve (Mashonaland Central), Hwedza (Mashonaland East), Lupane (Matabeleland North) and Mangwe (Matabeleland South) (Fig. 1). These areas rely entirely on subsistence farming, which is dependent on natural rainfall. Reliance on subsistence farming also means most of the inhabitants have seasonal employment and are also under-employed\(^4\). The main outputs of this system are food crops as well as some cash crops and livestock\(^4\). Drought resistant crops are popular with inhabitants of these areas but cash crops also earn these people some money for other family needs. Livestock farming is dominated by males in all the four districts\(^5,6\). Other households supplement their income by engaging in activities such as beekeeping, making souvenir crafts, spinning and weaving, working in retail shops, transport business and ethnic veterinary medicine. Mashonaland province has the shona speaking people (Karanga and Korekore) while in Matabeleland province has the Ndebele speaking people\(^4\). Both the shona and Ndebele people believe in indigenous religion and spirituality. All believe in the Supreme Being they call Mwari (God), or the creator of human beings (Musika vanhu). The Shona and Ndebele social landscape is populated by visible and invisible beings with the invisible assumed to have greater power\(^2,3\). These people use IK on multiple issues in their community such as protecting themselves from wildlife like elephant, practices in traditional farming, treatment of child killer diseases (Nhova, Gwirikiiti), building houses, treating snakebites, and protecting fields\(^2,4\). IK is their knowledge of culture and tradition that involve dance, music, keeping livestock, appeasing spirits (kapira mudzimu/ukudhlala amadlozi), and respecting nature. It is part of everyday life, what they do in the community, food they eat, rules they follow as prescribed by elders\(^2,3,4\).

**The Concepts ‘Indigenous Knowledge’ and ‘Disaster Risk’: an explanation**

Indigenous knowledge is a kind of learning by doing, or adaptive management, developed over generations of living in a particular place\(^7\). Indigenous knowledge evolves all the time and involves constant learning-by-doing, experimenting and knowledge-building\(^4\). Indigenous knowledge encompasses spiritual relationships, relationships with the natural environment, and use of natural resources, and is reflected in relationships amongst members of a society and their language. In short, indigenous knowledge is multi-dimensional and hence understanding it requires the application of several indicators. Since it is practical knowledge obtained as society members interact with their environment, then it implies that smallholder farmers’ traditional farming practices are a form of applied IK, since they are based on lived experiences\(^5\). Thus presumably, this knowledge is available and present within the local communities. Some scholars define IK in terms of its association with culture, people’s values and their ways of life, but as noted by Briggs\(^9\) such a definition excludes the fact that it is sometimes developed or modified by incorporating external influences. The exclusion of external forces in its production process implies that IK is primarily place-specific in nature although it can presumably be generalizable. The production of IK is then just based on a given environment, culture or society and other social factors, such as beliefs\(^10-12\). In this study, the combined term indigenous/local knowledge is used and “Indigenous Knowledge (IK) defined as that knowledge that is unique to a given culture or society acquired by local people through daily experience.

The terms “disaster reduction” and “disaster risk reduction” have also often caused confusion, although both terms refer to the same phenomenon of DRR\(^13\). Van Niekerk\(^13\) further explains that disaster risk reduction indicates an emphasis on what is being reduced; as opposed to “disaster reduction” that provides a perception that disaster (risk) reduction focus on disasters, rather than hazards and conditions.
of vulnerability. The international Strategy for Disaster Reduction (ISDR)\textsuperscript{14} defines disaster risk reduction as “the systematic development and application of policies, strategies and practises to minimise vulnerabilities and disaster risks throughout a society, to avoid (prevent) or to limit (mitigate and prepare) adverse impacts of hazards, within the broader context of sustainable development”. The UNDP\textsuperscript{15} concurs with the ISDR definition. The World Bank\textsuperscript{16} simply states that [disaster] risk reduction is to avoid hazards and reduce vulnerability. From these deliberations it is clear that disaster risk reduction entails a very wide focus on issues on a strategic level that include policies, strategies and practices. These issues are envisaged to ultimately reduce or eliminate conditions of hazard and vulnerability at the local level. Reducing risk requires that all stakeholders change their perceptions and behaviours to place a high priority on safety in planning and development\textsuperscript{19}. The World Bank further indicates that measures such as land use planning, structural design, construction practices and standards and disaster warning systems are examples of risk reduction\textsuperscript{16}. This term uses sustainable development as its basis of understanding, in other words, disaster risk reduction can only be successful within the context of sustainable development.

**Research methodology**

This research was underpinned by the interpretive/constructivist framework which views reality as existing in the human mind and is conditional upon human experiences and interpretation\textsuperscript{17}. The same framework sees reality as not independent from human thought, but socially constructed and with varied meanings. Since the aim of this study was the identification and analysis of individual and group constructions or interpretations of reality, this framework was seen as the most appropriate. Thus, qualitative methodology, specifically ethnographic design, was employed. Ethnography involves the study of social interactions, behaviours, and perceptions that occur within groups, teams, organisations as well as communities\textsuperscript{18}. The method provides rich, holistic insights into people’s views on actions including the nature of the location they inhabit. The major features of ethnographic research include: a strong emphasis on exploring the nature of a particular social phenomenon, rather than setting out to test hypothesis about it\textsuperscript{18}. Ethnographic research works primarily with ‘unstructured data’, investigates a small number of cases and the analysis of data in this approach involves the explicit interpretation of the meanings and functions of documented human actions. The product of ethnographic studies takes the form of verbal descriptions and explanations. Qualitative methodology is essential because it goes beyond mere fact and surface appearances this study focuses on the importance of the experiences that the residents and farmers of the areas have gone through and how these experiences have sharpened their senses to respond to and learn from the disasters they experienced\textsuperscript{19,20}.

Qualitative research is particularly effective in the procurement of culturally specific information about the values, opinions, behaviours, and social contents of particular populations and is therefore relevant for this study because indigenous ways of disaster mitigation in the study areas are based on indigenous knowledge and steeped in religious beliefs and worldview.

The research was carried out through the use of interviews (both open ended and structured), as well as participant observation. Non Probability sampling method was used specifically purposive sampling was employed to identify participants. Six participants per each of the four areas were identified thus bringing the total number to 24. The average age of participants was 62 yrs since the elderly and traditional leaders were the targeted population. Taking into account the amount of time needed to interview, transcribe, code and identify emerging issues, it was felt that 24 participants were an appropriate sample. The interviews were conducted in homes, popular leisure spots and at workshops arranged by district officers. All in all, informal interviews, structured interviews and observations were used as a form of triangulation to support and verify our overall findings. Consistent with a qualitative approach, interviews were not a one-off event. Follow up interviews were conducted subsequently until nothing new could be obtained (Saturation). Knowledge and observations were reinforced and verified in the process. Lastly, ethical issues were also addressed. Participants were initially briefed about the purpose of the research and were assured that the information they provided was for educational purposes only and that no names would be mentioned in the write up. Participants were also given the right to opt out of the interviews should they feel that the issues being discussed were against their conscience or interests. However, all
those initially identified to participate chose to remain in the study.

**Extractions and reflections from the ‘Archives’ of vulnerable communities**

It is amazing how much wealth of scientific information is locked up in indigenous societies, with the main impediment against its broader recognition being that it has not been recorded or synthesized. A sweeping feature across all the findings was that in all the four districts of the country, community members were able to explain what to do in order to minimize disaster risk but could not give the scientific explanation as to why such a tradition was adopted. In short most traditional solutions work and are of a scientific nature though community members lack the knowledge to explain in scientific language. Findings reflect that IK was applied to issues relating to agriculture and food security, climate change, environmental management and sustainable development. This is particularly obvious if the systems approach is used, in which inputs, processes and outputs are all documented. Agriculture in Zimbabwe has an indigenous flavour that has developed over time. The agriculture system is dynamic, having been influenced by innovations emerging from within it as well as those adopted from other systems, particularly international agricultural systems. Agricultural technologies identified in this study include crop diversification, varying planting and harvesting dates, supplementing moisture availability, soil conservation techniques, and diversifying from crop farming to non-crop farming activities like beekeeping, ethnic veterinary medicine practices and hunting.

Incidentally, traditional community members claim that technologies such as the application of organic manure, fallowing, intercropping, crop rotation and conservation farming were not brought by colonial masters but that these have been used since the days of Great Zimbabwe Empire (c1200 – 1680). That is the reason why agriculture was able to sustain such a large society. Actually, colonial agriculture largely destroyed traditional structures since it dictated what natives could grow and not grow, so as to give settlers a competitive advantage. This historical dimension surfaced in all the 4 research sites. In the drier areas in Lupane and Guruve conservation agriculture was and is practised to reduce evaporation of moisture from the soil and increase crop yields and food production. Traditional varieties of cereals that are drought resistant have always been grown to ensure food security. These indigenous grains include millet and sorghum varieties popularly known as Mukadzi usaende. However, a critical analysis of the claims by participants makes one fail to draw a line between traditional knowledge and skills imparted through the agricultural technologies identified in this study include crop diversification, varying planting and harvesting dates, supplementing moisture availability, soil conservation techniques, and diversifying from crop farming to non-crop farming activities like beekeeping, ethnic veterinary medicine practices and hunting.

Indigenous Knowledge as a predictive tool in climatic related disasters

Indigenous long term and short term weather forecasting methods are probably the classic example through which traditional communities use to manage climatic related disasters such as droughts, floods and food shortages. These weather forecasting methods have largely assisted the communities in planning both daily and seasonal activities and hence ensure agricultural sustainability. There are signs that assist traditional communities to put in place disaster mitigation measures as early warning. The community’s reliability on IK weather forecasting methods has been found to be trustworthy judging by the expressions and opinions of the participants. These were brought out at different times and different interviews as the researchers were seeking saturation concerning effectiveness of IK in disaster risk reduction. The study also noted that traditional weather forecasting an aggregate of reading many natural signs, and hence the occurrence of the same signs has come to be associated to any weather related hazards that communities may experience (Table 1).

An interesting aspect of these signs is that scientific or geographic explanations are available though the communities themselves lack the skill to use such. It is true that dew on leaves or other objects during the morning signifies condensation taking place at ground level over night. This implies that by next morning air would be dry hence chances of rainfall are slim unless a moist air mass moves in. This observation is scientifically accurate, and it is such knowledge that is used traditionally to plan for the day’s activities. A frequent change of wind direction in summer signifies convergence of air masses that bring rain to many parts of Zimbabwe. All the districts studied except Mangwe lie within the path of the Inter Tropical Convergence Zone (ITCZ). Zimbabwe benefits from the convergence of the warm moist Congo air with the South East Trade winds from the Indian Ocean. Thus communities have learned to predict the onset of rains...
accurately by interpreting changes in wind direction, although they may not be aware of the scientific mechanisms involved. Prolonged absence of wind direction changes (convergence) could signal a short growing season or the likelihood of a drought. With this knowledge, these communities would not be caught completely unawares by a climatic disaster such as a drought. Similarly, while a sudden surge of the small brown cricket called *Ndororo* (*Curtilla africana*) into highland areas signifies saturated ground; to traditional communities it signifies an impending danger from flooding. This may also signify reduced harvests due to leaching of nutrients, rotting and water related disease.

**Taboos**

Disasters were also averted through the use of taboos within both the Shona and Ndebele societies. *Taboos* (*Ziyeriswa*) are prohibitions to or of an action or behaviour that is believed to be either too sacred or curse related for community members to undertake. In most cases these taboos are based on the fear of the unknown but for whatever reason those who craft such practices aimed to preserve the status quo, a situation or the environment. One of the taboos common in the Mashonaland areas in particular was/is that weddings, parties, social gatherings, and traditional religious ceremonies cannot be held in November, which is considered a sacred month. Incidentally November is the month in which goats breed and have kids. Thus, this taboo originated long ago since the goat was used for multiple offerings in different traditional ceremonies. The elders interviewed pointed out that the aim was to protect goats, as any social function held in November would be disastrous to the survival of goats. No wonder why the month was named after the goat (*Mbudzi*). This tradition has survived up to the present day. Another taboo was and is still used to protect medicinal herbs in communal forests. People have been made to believe that some herbs cure only when consumed at point of location and not carrying any home. The idea was to preserve the medicine from commercialization and to ensure that it is available at all times to the rest of the community members; losing such herbs completely from overharvesting would be disastrous to the communities concerned. Other common taboos prohibit cutting down wild fruit trees and trading in wild fruit. Wild fruits act as a reserve granary for the community during times of distress, particularly droughts that are common in the southern Africa region. Thus, in short, *taboos* are part of a preservation mechanism meant either to prevent or manage a disaster situation.

**Survival practices**

Another important finding was the existence of survival practices that mitigate potential disasters in the communities. These practices have become acceptable traditions or imbedded in the lives of community members such that they are no longer conscious of their scientific functions. However, the elderly participants demonstrated their knowledge on such issues as full moon meant chances of less rain and exceptionally well developed wild fruit such as *Mazhanje* (Wild Loquat) and *Matamba*/Umtamba (Sweet Monkey oranges), *Tsubvu* (Chocolate berry) etc. Below normal to a poor rain season Grow drought resistant crops, Harvest and store fruits for future use Develop additional sources of drinking water

In short, Table 2 shows that are many IK methods used for disaster mitigation, and the IK mitigation strategies vary according the typology of the impending disaster.

### Table 1—Indigenous Knowledge weather forecasting methods common in all the four districts studied

<table>
<thead>
<tr>
<th>Sign</th>
<th>Explanation</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dew on leaves, objects, etc., in the morning</td>
<td>Less likely to rain that day</td>
<td>Schedule weeding, application of fertilizer</td>
</tr>
<tr>
<td>Breeze changing direction occasionally from South East and North West</td>
<td>Prolonged Rainfall most likely</td>
<td>Planting and avoiding activities affected by rain</td>
</tr>
<tr>
<td>Full Moon</td>
<td>Chances of rain slim</td>
<td>Weeding, harvesting, social activities</td>
</tr>
<tr>
<td>Exceptionally well developed wild fruit such as Mazhanje Mazhanje (Wild Loquat) and Matamba/Umtamba (Sweet Monkey oranges), Tsubvu (Chocolate berry) etc.</td>
<td>Below normal to a poor rain season</td>
<td>Grow drought resistant crops, Harvest and store fruits for future use Develop additional sources of drinking water</td>
</tr>
<tr>
<td>Frequent cries from of a bird called Haya/Inkanku (Jacobin Cuckoo)</td>
<td>Rain season about to begin</td>
<td>Field preparation for the season</td>
</tr>
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</table>

**N=24**
Natural resources conservation through IK: Beekeeping – the Zimbabwe experience

We also observed that beekeeping has been a major activity practised by many people of Hwedza and Lupane Districts. IK related to beekeeping is used in most wards of the two districts. Apiaries are sited in forested areas and along the rivers in Hwedza while in Lupane they are situated near homesteads and some in the gardens. Modern hives are not a common sight; traditional hives dominate. Thefts are not common as community members believe in protecting their hives with traditional Charms (muti), a traditional practice that people believe to be effective. Harvesting honey from the beehives is done by the owners themselves. Beehives are generally mounted up in trees as a disaster mitigation measure against honey pests such as the honey burger and forest/ground fires that are a common feature in the Savannah areas. During the dry season, traditional supplementary feeding for bees is practised so that they do not leave the beehives. The traditional beehives used by communities comprise of clay pots, dry hollow logs and Brachystegia tree barks. Thus deforestation has been reduced as communities see value in forests as provide forage for their bees. Trees useful for beekeeping are planted, retained, and well tended. Thus the conservation of trees and honeybees is a central task in sustaining their hive products. Forests are also protected from deforestation and fire hazards by use of beekeeping Taboos. Non beehives owners are not allowed to harvest from a hive not belonging to him/her. It is believed that the bees would be violent and would sting the person to death. In Hwedza, hives are not mounted close to homes as people are made to believe that chickens die after eating bees, yet this was done mainly to protect people from being stung by bees, in case the bee colony is disturbed. However in Mangwe and Lupane, beehives are placed near homesteads as the people believe that bees are able to identify the people they are accustomed to. Sustainable beekeeping has also been made possible by beliefs that Honey, according to traditional leaders and local villagers, has many uses. In times of food shortages, honey is harvested for food. It is used for medicinal purposes and in traditional ceremonies. Honey, it is believed, can also be used to make charms for good luck and finding good partners to marry in life; for this purpose it is mixed with sheep tail fat. Honey, when mixed with certain herbs, is also used for treating asthmatic conditions, heart and chest problems, dehydration related weakness in children, and controlling bed wetting in children. In short, IK is imbedded in the traditional science of beekeeping and conservation.

Recommendations and conclusion

Our study demonstrates that indigenous knowledge practices have been successfully employed in disaster mitigation in Zimbabwe. The lives of people in the areas studied are still guided by the knowledge that was handed down to them by their progenitors, and this knowledge has proved to be very important since by adhering to it, most of the people have managed to ensure that their food reserves are secure and have

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Table 2—Indigenous methods used to protect from disasters in all the four districts studied

<table>
<thead>
<tr>
<th>Typology of disaster</th>
<th>Description of IK Methods used</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Floods/Increased moisture</td>
<td>Cereal crops stored in a granary (Hozi) build on a granite rock outcrop (Dwala/Ruware) or raised on rocks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Building temporary shelter in flood plain and permanent houses on higher ground</td>
<td></td>
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<tr>
<td></td>
<td>Use of indigenous repellents like Zumbani for mosquitoes, traditional medicines</td>
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<tr>
<td>Animal disease outbreaks</td>
<td>Raised goat pens built with poles and mud mixed with dung to keep the hooves dry</td>
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<tr>
<td></td>
<td>Three to four cattle kraals are built to rotate cattle and enhance natural disinfection process</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fodder mixed with traditional medicine to cure known cattle diseases</td>
<td></td>
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<tr>
<td>Crop diseases and pests</td>
<td>Use chickens to control pests like locust</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early planting to help fight some species of migratory birds. By the time birds become active, they find the crop already matured hence they fail to eat since it will be hard.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intercropping to avoid concentration of certain pests and fungus</td>
<td></td>
</tr>
<tr>
<td>Poultry diseases</td>
<td>Use of traditional herbs with anti-biotic properties to immunise and control disease</td>
<td></td>
</tr>
<tr>
<td>House fires</td>
<td>The granary (Hozi) is completely plastered with mud on the floor, walls and roof to avoid impact in case of fire</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hut doors face west to protect them from strong winds that usually blow from the East, South East, North and North East</td>
<td></td>
</tr>
</tbody>
</table>

N=24

Source: Primary data Source of base map: Wiki Maps.
been able to mitigate bad weather and other associated hazards. They have also learned from the same natural signs when to go out during the rainy season and when not to go out. This has helped most people to avoid not only getting wet but also avoid getting swept away by flooded rivers.

Since the proportion of unsustainable practices in traditional knowledge systems is much smaller than the benefits accrued through their use in contemporary modern life and belief systems, there should be development, use and adaption of modern technologies that are linked to indigenous knowledge systems. Developing contextually relevant educational processes that identify and build upon local knowledge and expertise for disaster risk reduction is needed and where possible, expressed in local language and context. Vulnerable villagers should have more legitimate authority over natural resources. Vulnerable indigenous communities are more responsive than local government authorities. Researchers and policy makers could encourage the continued use of such IK practices and integrate them with modern approaches to disaster mitigation to ensure continued disaster risk reduction practices in vulnerable communities.

However, it is important to note that not all indigenous practices are beneficial to a local community; and not all indigenous knowledge can a priori provide the right solution for a given problem. Indigenous technologies and practices need to be scrutinized for their appropriateness just as any other technology and practice. Nevertheless, incorporating IK technologies into disaster reduction policies can lead to effective disaster mitigation strategies that are cost-effective, participatory and sustainable. There is a need therefore to integrate this Indigenous knowledge into formal DRR policies. The paper therefore concludes by highlighting that combinations of indigenous and scientific techniques have the potentiality of contributing to disaster planning and mitigation and also sustaining vulnerable communities.

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