African Journal of Sustainable Development

ISSN 2315-6317

Volume 2 Number 1 | 2012

Centre for Sustainable Development
University of Ibadan

African Journal of Sustainable Development

Volume 2 No.1 2012 ISSN 2315-6317

Centre for Sustainable Development, University of Ibadan

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Publisher: the AJSD is published by the Centre for Sustainable Development, University of Ibadan, Nigeria in collaboration with the African Sustainable Development Network.

Published by

University of Ibadan Centre for Sustainable Development,
20 Awolowo Avenue, Old Bodija Estate
Ibadan, Nigeria

ISSN 2315-6317

Printed by Sapphire Prints
08034892535 . 08070709894

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Application of Indigenous Knowledge to Flood Prevention and Management

WAHAB Bolanle & S. K. OJOLOWO

Abstract

In the last three decades, flooding has become a nightmare associated with rainfall in all the continents of the world, as it records heavy casualties everywhere and each time it occurred. Flooding is now a big and seemingly unstoppable environmental threat to rural and urban settlements, in both developed and developing countries, regardless of their topographic traits (mountainous or lowland) and locations (coastal or landlocked). It is no longer limited to coastal communities, such as Vancouver, Bangkok and Manila or Lagos, Port-Harcourt, Warri, Sapele, Calabar, and Yenagoa in Nigeria, as many residents of landlocked cities, towns, and villages have been killed and properties destroyed by flash flood. Flooding has significantly impacted peoples' housing, transportation, electricity, water and sanitation infrastructure, food and livelihood security. Engineering measures to address the effects of flooding through the provision of hydraulic structures seem inadequate. Indigenous knowledge (IK) has been practiced in rural communities over time to address disasters and it has been found to be effective in the protection of the lives and properties of the people and communities. This paper examines the application of indigenous knowledge to flood control and management in urban and rural communities in different parts of the world. It reviews the traditional rain prediction and flood control mechanisms as well as the coping and adaptation strategies practiced in the communities as reflected in their IK. The paper argues that it is imperative to augment western flood control practices with indigenous lood prediction and management skills to achieve sustainable flood prevention and control.

Key words: Indigenous knowledge, flooding, communities, flood management, livelihood security.

Introduction

Globally, flooding is presently a nightmare associated with rainfall, as it records casualties each time it occurs. It is one of the most common natural disasters, irrespective of the state of human development and natural conditions (Agbola et al., 2012). Flooding has remained the second deadliest of all weather-related hazards in the United States, and has been detrimental in many other societies in most parts of the world, because of the large numbers of fatalities and the costly damages to properties and human lives (Ashley and Ashley, 2008). The occurrence of floods is presently the most frequent among all natural disasters globally and in 2010 alone, 178 million people were affected by floods. The total losses in exceptional years such as 1998 and 2010 exceeded $40 billion (Jha et al., 2012). However, one advantage of floods is that they sustain ecosystems and the services that ecosystems provide. In Cambodia, the annual floods occurring on the floodplains of the Tonle Sap Lake are of prime importance in keeping and making the lake one of the most productive freshwater ecosystems (in terms of fish catch) worldwide (World Meteorological Organization, 2009). This high level of productivity contributes strongly to regional food security (Van Zalinge, 2003). In the Amazon, for example, insufficient flooding has directly affected fish and turtle reproduction – two species that indigenous peoples in the Amazon depend upon as a food source (Kronik and Verner, 2010).

Flood hazards are natural phenomena, but damage and losses from floods are the consequence of human action arising as a fall-out of uncontrollable urbanization and sub-urbanization both of which generate negative environmental, economic and social externalities. Flood is one of the negative environmental consequences of urbanization and sub-urbanization (in the form of what UN-HABITAT (2010) terms "peripherization" (informal settlements) or "suburban sprawl"). The urban population in Nigeria has been growing at the rate of between 2% and 5% per year since the 1990s (Olokesusi, 2004).

Overall, the growth is adding several thousands of people each year to cities and towns of the estimated total population of over 150 million. About 45% reside in urban centers with the highest concentration in the large metropolitan areas such as Lagos, Ibadan, Kano and Port-Harcourt (Raheem, 2011). Urbanization aggravates flooding by restricting where flood waters can go, covering large parts of the ground with roofs, roads and pavements, obstructing sections of natural channels and building drains that ensure that water moves to rivers faster than it did under natural conditions. Ayoade (2006) asserts that the impervious human-made surfaces that make up the urban fabric ensure that little of the falling rain infiltrates into the ground. The implication of this is that when rainfall intensity exceeds the infiltration capacity of the soil, excess water is generated (Oni, 2003) which results in flood. The rural areas are not better off. Flooding incidences in rural areas is becoming increasingly worrisome because of the large loss of crops and agricultural land associated with them (Raheem, 2011).

Despite advances in knowledge and technology (e.g., satellite coverage or surveillance techniques), vulnerability to and the risks from natural hazards have been rising in developed and developing countries (Dekens, 2007). Engineering measures have been applied by governments to ensure human and material safety during and after flooding to no avail. Drainage, culverts, and bridges worth billions of dollars have been constructed, yet floods destroy properties and claim lives. However, it is pertinent at this juncture to look inwards for knowledge, skills, and materials originating within communities, based on local needs, and specific to culture and context to augment modern scientific, environmental and engineering solutions in solving the menace of environmental disasters, particularly flooding. Wahab (2010) asserts that disaster management is a key area where the use and application of indigenous knowledge (IK) has been found to be very effective. The Earth Summit that took place in Rio de Janeiro in 1992 formally recognised the importance of IK for sustainable development (Wahab, 2010).

Research has considered indigenous people and knowledge as key elements for adaptive management (Boedhihartono, 2010). Ulsrud et al. (2008) assert that people are adapting to a whole set of factors that

influence them, both climatic and non-climatic. Indigenous knowledge is usually shared among local communities and transferred from one generation to the next, through oral traditions and story-telling. It is the knowledge which was evolved, institutionalised and perfected by a people and passed on to succeeding generations through inheritance from their ancestors (Wahab, 1996). Indigenous knowledge is also the knowledge that people in a given community have developed over time, and continue to develop. It is based on experience, often tested over centuries of use, adapted to local culture and environment, dynamic and changing (IIRR, 1996). Traditional knowledge is very rich and is constantly being tested, further enriched and updated. Culture and knowledge are eternally changing and must continue to co-evolve to enable us to adapt to our changing environment (Macchi et al., 2008). Indigenous knowledge systems (IKS) are a body of knowledge used by societies in Africa and the rest of the world for various purposes depending on the needs of the particular society (Shoko, 2012).

Conceptual Framework and Literature Review

This section of the paper examines the concept of Integrated Flood Management in relation to the-bottom-up approach in solving the challenges of perennial flooding in communities by the active involvement of indigenous people in forecasting, preparing, controlling and mitigating the impact of flood.

The Concept of Integrated Flood Management

Integrated Flood Management (IFM) is a new approach to flood management that intrinsically considers the riparian ecosystems, including humans and their wetland activities. The IFM is a process which promotes an integrated, rather than fragmented approach to flood management (World Meteorological Organisation (WMO), 2009). The concept is an improvement on structural solutions (dams and reservoirs, embankments and bypass channels) that alter the natural environments of rivers, resulting in losses of habitat, biological diversity and productivity of the natural systems. It is now widely recognized that a paradigm shift is required from defensive action and flood control to the integrated management of floods. The need for this paradigm

shift is the inspiration behind the Integrated Flood Management concept which seeks to integrate land and water resources development in order to maximize the net benefits from flood plains, with flood risk awareness, and minimizing the loss of life from flooding (APFM, 2004; WMO 2009). Being a holistic approach, IFM lays emphasis on the interrelationship between socio-economic development and flood management. At the same time, it ensures the protection of natural ecosystems for reducing the vulnerability of people whose livelihoods depend on the ecosystem service (Ongor, 2007).

Flood management plays an important role in protecting people and their socio-economic development in floodplains (WMO 2006, 2009). In community- based resource management (CBRM), the approach of local communities taking decisions about agriculture, fishing, health practices and the management of their natural resources, are based on their worldviews (COMPAS, 2001). The inclusion of the locals in decision making promotes community development. Wahab (2006) asserts that community development is a process through which a community attempts to improve the social, economic, and cultural situation. The involvement of the community in policy making and implementation promotes endogenous development. Endogenous development has been described as a type of development that builds on local resources, local knowledge, local culture and values, as well as local institutions and leadership (Millar et al. 2008; Miller, 1999). This development approach is used by local people to protect their physical environment and its fragile wetlands.

Ensuring a healthy environment for wetlands is intrinsic to the concept of IFM. The concept advocates understanding the interactions of water bodies to their floodplains, which are largely driven by the flow regimes (Fig. 1). Water bodies continuously move about their floodplains. Seasonal occupation of the floodplains by excess runoff is an essential requirement of maintaining the river corridor (i.e. the river channel and its associated floodplain) characteristics. At this juncture, the knowledge of the local people becomes very important to ensuring sustainable management of floodplain based on accumulated experience from seasonal variation in river or stream activities.

Integrated Flood Management serves as the foundation for Indigenous Knowledge integration into flood related policy-making and planning. It highlights areas of anthropogenic dynamisms that must be factored in planning and policy-making processes if floods are to be managed in a sustainable manner. APFM (2004), opines that IFM is an approach to flood management that improves the functioning of the river basin as a whole, because it recognises that floods have beneficial impacts and can never be fully controlled. Integrated Flood Management maximizes the net benefits from the use of floodplains and minimizes loss of life from flooding, flood loss reduction and efficient use of the floodplain.

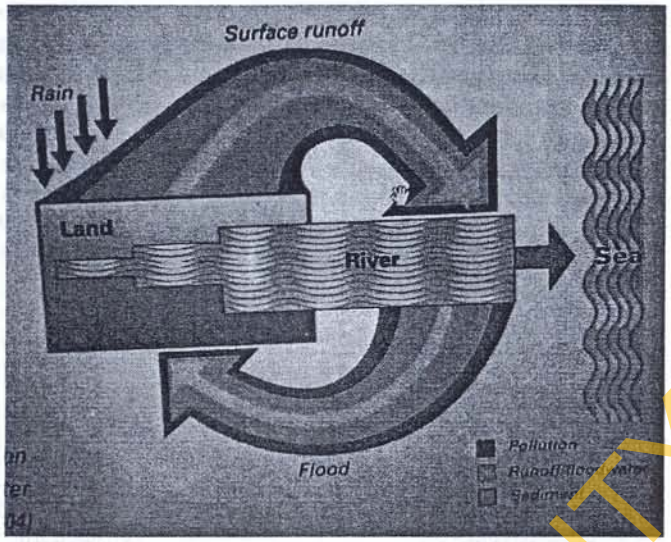

Fig. 1: Interaction between land and water
Source: APFM (2004), p. 22

The Associated Programme on Flood Management (2004) and WMO (2009) highlight six integral elements of IFM (fig. 2) for sustainable flood management.

These factors are:

i) management of the water cycle as a whole;
ii) integration of water and land management;
iii) management of risks and uncertainty;
iv) adoption of a best-mix of strategies;
v) ensuring a participatory approach, and
vi) adoption of integrated hazard management approaches.

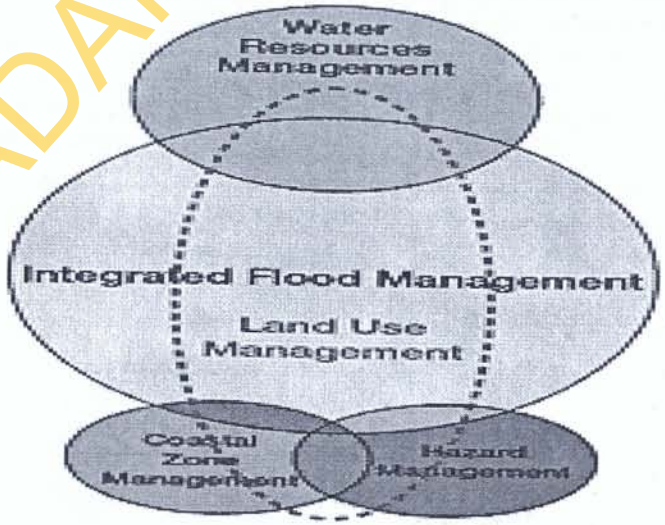

Fig. 2: Integrated Flood Management Model
Source: APFM 2004, p. 14

Indigenous Knowledge Systems

Knowledge, according to Olokesusi (2006) refers to the "know-how" and "do-how". Knowledge includes formal and informal, modern and traditional "know-how" and "do-how". Indigenous knowledge has been defined variously as local knowledge unique to a people in a given

area or culture; knowledge developed, perfected and utilized over many generations and disseminated orally (Titilola et al., 1994; Wahab, 1996; Warren and Rajasekaran, 1993). Indigenous Knowledge Systems are sets of actors, networks or organisations which are expected to work synergically to support knowledge processes that improve the correspondence between knowledge and environment, and/or the control; provided through technology use, in a given domain of human activity (Roling & Seegers, 1991). Warren et al. (1995) see indigenous knowledge as local knowledge that is unique to a given culture or society and contrasts with the western scientific knowledge, or as they prefer to call it, the "international knowledge system" which is generated through a global network of universities and research institutes. Indigenous knowledge is a dynamic and ever-changing accumulation of the collective experience of generations. Indigenous knowledge is extremely relevant to all human activities as it promotes the full and active participation of local people in their own affairs in all ramifications (Wahab, 1996). The knowledge systems have evolved from very many years of experience and trial and error problem solving by groups of people working to meet the challenges they face in their local environments, drawing upon the resources they have at hand (Olokesusi, 2006; Wahab, 2010).

Globally, indigenous peoples have sustained their peculiar cosmovisions and associated knowledge systems for millennia, even while undergoing major social upheavals as a result of transformative forces beyond their control. Many of the core values, beliefs, and practices associated with those cosmovisions have survived and are beginning to be recognized as being just as valid for today's generations as they were for generations past. The depth of indigenous knowledge rooted in the long inhabitation of a particular place offers lessons that can benefit everyone, from educator to scientist, as we search for a more satisfying and sustainable ways to live on this planet (Barnhardt and Kawagley, 2005). Indigenous knowledge is a body of knowledge built up by a group of people through accumulation of experience to close contact with nature and applying same to all spheres of living in a particular environment; as illustrated in Figure 1.

Over many generations, indigenous people have constructed their own ways of looking at and relating to the world, the universe, and to each other (Barnhardt and Kawagley, 1999; Eglash 2002). Their traditional observation processes were carefully crafted around variability in natural processes, adapting modes of survival, obtaining sustenance from the plant and animal world, and using natural materials to make their tools and implements. All of this was made understandable through demonstration and observation accompanied by thoughtful stories in which the lessons were imbedded (Kawagley, 1995; Cajete, 2000). Actions currently being taken by indigenous people in communities throughout the world clearly demonstrate that a significant "paradigm shift" is under way in which indigenous knowledge and ways of knowing are recognised as constituting complex knowledge systems with an adaptive integrity of their own (Barnhardt and Kawagley, 2004).

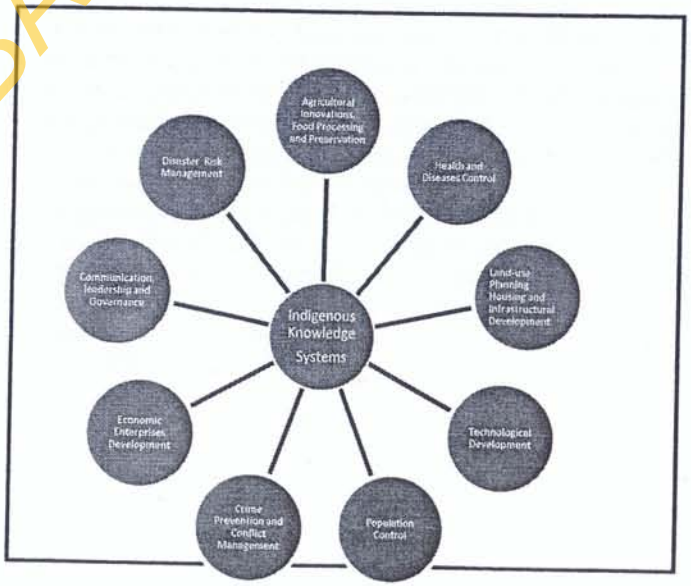

Figure 3: The Sphere of Indigenous Knowledge
Source: The authors

The Nature and Acknowledgement of Indigenous thoughts on Disaster Management

Globally, the indigenous peoples have developed local approaches to solving environmental challenges that are hydrometeorological in nature, particularly those who live in disaster-prone areas. According to Wahab (2010), such people have built-up tested knowledge systems and strategies through several years of experimentations, experiences and intimate contact with the environment to deal with such disasters. These tested knowledge systems and strategies have become more or less their scientific mode of cushioning the impacts of disasters. As noted by Ogawa (1995), every culture has its own science and refers to the science in a given culture as its "indigenous science". Observations are usually made over a lifetime for possible application to solving societal challenges. Hunting peoples carefully study animal and plant life cycles, topography, seasonal changes and mineral resources (Snively and Corsiglia, 2000). Elders speaking about landscape, climate and ecological changes usually base their observations on a lifetime of experience (Cruikshank, 1991). It will be useful to suggest that science is not a monolithic entity; rather, as Bauer (cited in Pielke, 2002) notes: it is "a mosaic of the beliefs of many little scientific groups" with a variety of perspectives that individual scientists themselves possess and the studied objects bestow on them (Pielke, 2002). Along with science, local technologies (Gandhi, 1982) and people's knowledge systems such as ethno forestry have an important role to play for biodiversity conservation and sustainability.

Traditional narratives may contain highly technical information useful for communal survival. Anthropologist Robin Riddington (n.d.) (cited by Snively and Corsiglia, 2000) suggests that oral tradition is a critical adaptive strategy for hunters and gatherers, particularly in harsh environments. He argues that the conceptual ability to recreate through language, a situation for someone who has not yet experienced it directly, is a highly adaptive technology carried in the mind, rather than in the hand. Detailed descriptions of how to correctly make a caribou snare, how to make a snowshoe, how to trap some particular animals, or how to find the way back home are variously embedded in stories. Accurate transmission from generation to generation becomes critical

for group survival; therefore, each generation is careful to get the critical aspects accurate. "This is the kind of detailed observation and technical thinking valued by scientists" (Cruikshank, 1981).

The global scientific community acknowledged the relevance of indigenous knowledge and endorsed it at the World Conference on Science held in Budapest, Hungary, from 29 June to 1 July in 1999 by recommending that scientific and traditional knowledges should be integrated particularly in the field of environment and development (UNESCO, 2000). Their rich and detailed traditional knowledge reflects and embodies a cultural and spiritual relationship with the land, ocean and wildlife (McLean, 2010). Prior to this, the UN 1992 conference on environment and development in Rio de Janerio gave recognition to indigenous people's knowledge systems. As Wahab (1997, 2010) observes, at least 17 chapters of the Earth Summit's *Agenda 21* (UN 1993) mention IK, acknowledging that local people have intrinsic knowledge of their environment, warning that IK was being lost and strongly recommending that development efforts build on IK. The United Nations Environment Programme (UNEP) (2008) recognizes the role of indigenous knowledge in the conservation of natural resources and management of natural disasters. Indigenous knowledge is still intact among indigenous or local communities in many parts of Africa. This recognition was reaffirmed at IPCC's 32nd Session (IPCC, 2010) and consideration of traditional and indigenous knowledge was included as a guiding principle for the Cancun Adaptation Framework (CAF) that was adopted by Parties at the 2010 United Nations Framework Convention on Climate Change (UNFCCC) Conference in Cancun (UNFCCC, 2010).

However, this knowledge is not well documented and it stands in danger of being lost as its custodians are passing away. In four states in southern India, according to Shankar et al., (2002), the average age of the traditional health workers is now over 50 and successors are limited in numbers. In the past, among the indigenous people in the Arctic Region, before young men were allowed to venture out on their own, Yup'ik elders taught them in the communal men's house about the ocean and its dangers (Nakashima et al. 2012). Yup'ik elders are concerned about the lack of such teaching today (Fienup-Riordan and

Rearden, 2010). Perhaps this was why UNEP together with its partners in Kenya, South Africa, Swaziland and Tanzania conducted a study in 2004-2006 to provide information on the use of indigenous knowledge in environmental conservation and natural disaster management in the four countries (UNEP, 2008). The study clearly shows that disregard for indigenous knowledge can have negative effects on the environment. On the other hand, the use and application of appropriate indigenous knowledge systems can promote environmental conservation (land, forests, grasslands, wetlands and biodiversity) and management of disasters in disaster prevention, mitigation, recovery, prediction or early warning, preparedness, response and rehabilitation (UNEP, 2008).

Literature Review

Studies abound on the applications of indigenous knowledge and technologies to unscramble challenges in areas of agriculture and food security (Radcliffe et al., 1995; Ellis, 2000; Wahab 1997), health (WHO 1976; Oyebola, 1980; Warren, 1991; Warren 1996; Shankar et al., 2002), housing and environmental sanitation (Wahab, 1997; Appiah-Opoku, 2007), weather and climate change adaptation (Awosika et al., 2001; Bidyadanga, 1999; Cruikshank, 1991; Dictan, and Ellen, 2006; Raheem, 2011; Eneji et al., 2012), conflict resolution (Castro and Ettenger, 1996; Colson, 1974; Cohn, 1967; Gulliver, 1971) flood control and management strategies (Dhungel, 2011; Eneji et al., 2012; Fabiyi et al., 2012).

Effective and efficient control of environmental degradation is a function of in-depth knowledge of the environment by the indigenous people all over the world. Indigenous knowledge has been applied to effectively control land degradation. Gonese and Tivary (2001) concluded that indigenous organizations have been involved in the process of 'healing the land and its elements' guided by traditional and spirit mediums. Indigenous knowledge has been practiced in rural communities over time to address disasters and it has been found to be effective in the protection of the lives and properties of the people and communities. This review is based on indigenous practices that have to do with management of riparian areas, traditional rain prediction and

flood control mechanisms as well as communal flood coping and adaptation strategies.

Indigenous Hydrometeorological Culture

From time past, local people have developed a variety of resource management practices that continue to exist in tropical Africa, Asia, South America and other parts of the world (Appiah-Opoku, 2007). Traditional African societies observed environmental ethics that help in regulating their interactions with the natural environment (Shastri et al., 2002). The indigenous peoples of Australia consider water as not only very significant for their social and economic well-being, their (the indigenous people's) relationship with waters, lands and its resources is crucial to cultural vitality and resilience (Altman and Jackson, 2008). Water is regarded as a resource of high cultural value in Australia where the indigenous peoples are connected to and responsible for environmental preservation and protection of their lands and waters from which they in turn obtain and maintain their spiritual and cultural identity, life and livelihoods. These cultural and customary rights and responsibilities, according to Altman and Jackson (2008), include: i) a spiritual connection to lands, waters and natural resources associated with water places; ii) management of significant sites located along river banks, on and in the river beds, and sites and stories associated with the water and natural resources located in the rivers and their tributaries, and the sea; iii) protection of indigenous cultural heritage and knowledge associated with water and water places; and iv) access to cultural activities such as hunting and fishing and ceremonies.

In Australia, indigenous peoples regard the inland waters, rivers, wetlands, sea, islands, reefs, sandbars and sea grass beds as sacred. This is because they are aware that water is vital to life, essential to agriculture and a valuable energy source which may be utilised in the mitigation of climate change impacts. According to Altman, and Jackson (2008), non-Indigenous Australians consider water as a spiritual, natural resource and a commodity that is not only essential to livelihood, but has significant economic contemporary value. Extolling the virtues of water, Bidyadanga (1999) was quoted in Altman and Jackson (2008: 171) thus: "Water is the life for us all. It's the main part. If we are gonna loose

that I don't know where we gonna stand. If that water go away, everything will die. That's the power of water. He connect with the land. *Pukarrikarra* (the dreaming) put 'em all together. One life."

In Besao, Philippines, according to Wahab (2010), traditional management of water resources is closely associated with religious beliefs in *nakinbaey* (the spirits of nature) that inhabit water sources and are believed to be responsible for producing water. To guarantee the water supply, the iBesao consider it imperative for them to consciously respect water to prevent *nakinbaey* from leaving, by observing culturally prescribed behaviours and practices called the *inayan*. *Inayan*, literally meaning 'beware', governs the day-to-day behaviour and relations of Besao people and embodies Besao custom law (Dictaan and Ellen, 2006). Some of these *inayan* are that: i) human and animal remains should not be transported near water; ii) the butchering of animals, especially dogs, near an 'inhabited' water spring is considered dis-respective towards the water source; iii) it is prohibited to graze animals near or above water sources, and iv) the iBesao consciously avoid spitting or using soap near water sources, among others.

Gonese et al. (2002) discover the piety of wetland among indigenous people in seven provinces in Zimbabwe at the end of a consultative meeting held with traditional chiefs, village heads, and spirit mediums, who were at the same time farmers in 1985; during a fieldwork conducted by the Association of Zimbabwean Traditional Environmental Conservationists (AZTREC). It was discovered that each wetland had its own historical development and cultural dimension. Traditionally, the spirit mediums make decisions about wetlands and the chiefs, headmen and kraal heads enforce the regulations (Gonese et al. 2002). These regulations state that certain trees in the wetland cannot be felled, washing is not allowed, soap is prohibited, and only traditional utensils such as earthen pots are allowed for collection of water. Gonese et al. observe further that during menstruation, women are not allowed to enter the wetlands and men must remain celibate when working therein. The study also revealed that the wetlands have great development potentials. Many wetlands have the capacity to provide water for micro-irrigation activities, while for the people,

protecting these wetlands also means protecting the habitat of the spiritual world (Gonese et al. 2002).

Eneji et al. (2012) highlight rules and practices (Box 1) of the Obudu people in Nigeria that have being in use for over 60 years to conserve, manage, preserve and protect sources of drinking water. These rules and regulations are pointers to the imminent fact that the rural communities were aware of their environment and their dichotomy between things that are collective responsibility in the management of the watershed and water quality (Eneji et al., 2012). When water is disrespected, misused and poorly managed, we see the life threatening impacts on all of creation.

Mkenda (2010) observes that in the contemporary African worldview, there exists a dichotomy between things that are believed to be secular and those that are religious. He noted that the way people view the universe has changed. That science and western education has influenced man's sense of reasoning and judgment about the world which is no longer viewed in the religious sense but rather it is looked at as something to be totally exploited for the benefit of the human being. Africans in the contemporary time should borrow a leaf from traditional Africa. They should use African cultural heritage in the preservation and rehabilitation of the environment that has been destroyed and degraded by selfish economic motives of a few people (Mkenda, 2010; Snoo and Bertels, 2001). In the Yoruba speaking area of south-west of Nigeria, as a conservation strategy, such trees as "*iroko*", "*ose*", "*afara*", "*ogano*", kola nut ("*obi*") are worshipped by the locales and are, therefore, protected from indiscriminate felling (Wahab, 2004).

A scholar of African traditional religion, Mbiti (1969), in his book, "African Religions and Philosophy", remarked that "Africans are notoriously religious". The implication of this statement is that religion permeates and penetrates the whole life of an African (Eneji et al., 2012). Every societal function in African parlance is religiously intertwined. There is hardly a separation between what is secular and what is sacred in African society. Everything and every act is looked upon in a religious and customary perspective (Eneji et al., 2012).

Box 1: Indigenous Rules and Practices of Water Management in Obudu, Cross River State, Nigeria

- Felling of trees or fuel wood collection within thirty meters radius from streams and rivers is prohibited. This rule is meant to: preserve the watershed and vegetation; check the amount of evapotranspiration; allow some amount of tolerable water temperature for both micro and aquatic organisms to continue their ecosystem services for the enrichment of the soil; facilitate continuous supply of water and the healthy growth of the forest; Allow vegetation cover to keep the water cool and fresh for drinking, and protect the watershed from destruction.
- Location of residential settlements close to upper course of any stream, pond or river is not approved. This law is to check and control deforestation and farming around the neighborhood thereby protecting the watershed along the banks of the streams and rivers. It also prevents domestic sewage waste from being washed down into the streams and rivers.
- Bathing and washing of clothes around, near or inside ponds, streams/river where drinking water is fetched is not allowed.
- Fishing or harvesting any aquatic animals within drinking streams, pond and rivers is not allowed.
- Cleaning up of drinking streams is the responsibility of every member of the community and is carried out within a specified length of time by community members; failure to attend such clean ups and sanitation attracts a fine of either a goat, chicken or a specified amount of money. Sometimes this clean ups and sanitation are done by different age grades in the community and in turns too.
- Silence is observed within drinking streams for reasons spanning from respect for the gods of the streams who protect the stream and the organisms helping to purify the streams and keeping the stream alive to the control of spread of diseases. It is believed that while speaking, an infected person may spill or splash saliva, so an infected person with tuberculosis or whooping cough, for example, may spill infected saliva containing the bacteria into the water. This rule also ensures the gods are not provoked to anger which can result in streams or rivers drying up.
- Fishing or catching of crabs in drinking water sources is strictly prohibited. Fishing is only done at designated rivers or ponds and only during the dry season.
- Streams, apart from wells and springs that either flowed on a level land or are shallow are deepened at the upper source to form a natural pond or reservoir that will withstand the dry season and ensure water availability all year round.

Source: Eneji, et al., 2012

This must have prompted Wahab (2004) to assert that African religion is found in rituals, ceremonies, festivals, shrines, sacred places, objects, art and symbols, proverbs, riddles, names of places and people, myths and legends, beliefs and customs, and in the local languages. Africans view themselves as part of the environment (Mkenda, 2010; Taylor, 2002). Man is conceivable only in this cosmic interweavement. This web of relationship is what makes Africans view the earth as their mother and themselves as her children.

Little wonder, Africans refer to their land as mother earth. Despite the fact that humanity, nature and the gods are distinct concepts, they belong to some ontological categories that are interrelated and interdependent (Eneji et al., 2012). Therefore, plants, animals, rock, water and other non living things are part of nature, which is the product of creation deserving to be respected as much as human beings who are also part of nature. This is what makes Africans regard themselves as being in close relationship with the entire cosmos. In traditional African culture, being was not independent of nature (Taylor, 2002).

These beliefs guide, direct and control the arrangement of activities and structures in traditional space. Availability of water determines the establishment and location of any settlement. However, individual residential houses were built far away from the source of drinking water. Thus, the settlement was kept at a reasonable distance from the source of a river/stream. In time past, some patches of grassland and forest were set aside, normally close to settlements, as sacred lands that could not be touched. These lands so delineated are authorized and covered strictly by traditional /cultural laws. In most communities and countries in Africa, such areas still exist. The collective appellations for these areas are commonly referred to as sacred or fetish groves, evil forests and sacred ponds (Eneji et al., (2012). Such forests as identified by (Osunade 1991 quoted in NEST 1991), include: hunting forest (*igbó ode*), religious groves (e.g. *igbó orò, igbó awo, igbó ìgbàlè, igbó egúngún*), isolation or quarantine forests (*igbó àìwò, igbó èèwò*), and abode of fairies and spirits (*igbó iwin, igbó irúnmalè*).

Indigenous Weather Observation and Prediction Systems

Indigenous peoples are not strangers to climate and weather variability. They have age long experience in forecasting surplus or deficit of climatic elements such as temperature, rainfall, and humidity and have also devised mechanisms to cope with hydrometeorological hazards. Their experts are community elders, who rely on centuries of traditional knowledge and oral history as a sound knowledge base, on which they are then able to undertake their own monitoring of changes and make predictions (McLean, 2010). They are excellent observers and interpreters of change on the land, sea, and sky. Their community-based and collectively held traditional knowledge accumulated and maintained through practice over countless generations, offers valuable insights into the state of the environment. In the Philippines, farmers and fishermen rely on observing the behaviour of animals and insects to predict the coming of rains and bad weather (Galasgac and Balisacan, 2003). Mhita (2006) notes that before modern methods of weather forecasting the rural communities of Tanzania observed plants, animals and birds for weather forecasting. In Burkina Faso, apart from observing the behaviour of animals and plants, cultural and ritual specialists use visions, dreams and divination to predict weather (Rocoli et al, 2001 cited in IPCC Fourth Assessment Report, 2007).

McLean (2010) affirms that the local observations of direct effects of climate change by indigenous peoples corroborate scientific predictions, and effects include temperature and precipitation changes; coastal erosion; permafrost degradation; changes in wildlife, pest and vector-borne disease distribution; sea-level rise; increasing soil erosion, avalanches and landslides; more frequent extreme weather events, such as intense storms; changing weather patterns, including increasing aridity and drought, fire and flood patterns; and increased melting of sea-ice and ice capped mountains.

Local communities and farmers in Africa have developed intricate systems of gathering, predicting, interpreting and decision-making in relation to the weather. Indigenous methods of weather forecasting are known to complement farmers' planning activities in Nigeria. In a study of indigenous methods of weather forecasting

among the local people in Asa Local Government Area of Kwara State, Nigeria, Ajibade and Shokemi (2003) observe that over 95% of the respondents identified five weather systems, which they were capable of forecasting using accumulated experiences. These include rainfall, thunderstorm, windstorm, harmattan and sunshine — the knowledge of which the local farmers were able to use effectively to prepare for future weather. A similar study in Burkina Faso showed that farmers' forecasting knowledge encompasses shared and selective experiences. Elderly male farmers formulate hypotheses about seasonal rainfall by observing natural phenomena, while cultural and ritual specialists draw predictions from divination, visions or dreams (Roncoli et al., 2001). The most widely relied-upon indicators are the timing, intensity and duration of cold temperatures during the early part of the dry season (November to January). Other forecasting indicators include the timing of fruiting by certain local trees, the water level in streams and ponds, the nesting behaviour of small quail-like birds, and insect behaviour in rubbish heaps outside compound walls (Roncoli et al., 2001). In their study of whether forecasting in Chimanimani District of Manicaland, Zimbabwe, Risiro et al. (2012) found that traditional methods of weather forecasting ranged from biological (see table 1), atmospheric, relief and astronomic features. They also affirmed that the traditional methods can be utilised for the purposes of short term and long term seasonal weather predictions by local communities.

Rain and Flood Observation and Prediction

Predicting the weather is an important aspect of indigenous knowledge. Almost all traditional communities have specialists, ways and means of predicting and foreseeing impending events, calamities and disasters. In some communities, the role of predicting events is left to the elders, families or clans that specialize in that art. Risiro et al. (2012) observe that the natural burning of mountains such as *Murwangemhanga* which is found in Chimanimani area of Manicaland, Zimbabwe, was given as a sign of impending rains. The presence of frequent occurrence of mist or fog at mountain tops was regarded as a warning of coming rains. *Mukwerere* is a rain-making ceremony in Zimbabwe believed to bring some rain if properly done. These are organised by the Kraal head or Headman for the village. The rain

making ceremonies are done at sacred forests or under special trees such as *muonde* (Fig tree) that is believed to be associated with water (Risiro et al., 2012). The art of traditional rainfall prediction is, however, shrouded in mystery and is considered as a gift for a few. The potential person to inherit the art is identified in good time and is taken through the process of learning the art.

Table 1: Biological Weather Forecasting Indicators in Zimbabawe

Predictors	Description	Weather forecast Interpretation
Plant	Blooming of plants	Onset of summer season
	Plants shedding off leaves	Dry season
	Abundance of fruits e.g. *mazhanje [Uapaca kirkiana]* and *hacha[Parinari curatellifolia]*	Drought
Animal behavior	Presence of millipedes, frogs	Onset of rain season
	Rock rabbit crying in the morning and evening	Beginning of hot seasons
	Presence of reptiles in large numbers	Hot seasons beginning
Birds	Breeding of goats	Onset of raining seasons
	Presence of stock birds	Onset of rain season
	Singing of *riti*	Rain just about to come
	Singing and flying of *haya*	Rains in the near future
	Guinea fowls laying eggs	Onset of summer seasons
	Large number of qualla birds	Onset of winter season
	Swallows flying at low altitude	Rains to fall immediately
	Birds singing and flying high	Clear dry condition (stable weather)
	Birds seeking shelter during the day	Cloudy and humid conditions
Insects	Singing of insects such as *nyenze*	High temperature and onset of summer season
	Ants searching food	Rain season approaching
	Ants sealing off holes into ant mound	Rain to fall very soon
	Spiders running around	Rains about to start
Human ailments	Asthmatic attack, back aches, painful operations	Imminent cold weather and humid conditions

Source: Risiro et al. (2012), p. 563

Similarly, the Shona people of Zimbabwe rely on the observation of certain physical phenomena in order to make reasonable and sometimes almost accurate weather forecasts (Muguti 2012). They rely on the study of certain phenomenon such as trees, birds, frogs, animals, insects, grass, wind, sun, moon and lightening, among others. Fruit trees like *muchakata* (parinari curatellifolia), *gan'acha* (lannea discolor), *mushuku* (uapaca kirkiana) and mango are frequently used to predict the eminence of the rain season and the quantities of rainfall in any given agricultural season. If for instance, there is an abundance of fruits towards the encroachment of the rain season, Shona people would know that the season was likely to experience low rainfall patterns and vice versa (Muguti, 2012). As Muguti, (2012 further asserts, when the migratory birds like *mashohori, fudzamombe, haya* and *shuramurove* (all referred to as stock) begin to surface in a particular environment, then the rainny season is said to be imminent. The continuous singing, by day and by night, heralds the commencement of the rainy season. Mapara (2009) avers that people could also foretell whether rains are going to fall in the next hour or two if they hear the sound of *dzvotsvotsvo* (rain bird). On the other hand, however, when the migratory birds vanish from a particular area or region, it signals the decrease of rain and eventually its departure.

The people of Nganyi clan of Bunyore in western Kenya are known for their powers in predicting rain (Gilbert, 2010). The clan has been associated with community rainfall activities for over 100 years, and they have three shrines where they worship and communicate with their ancestors and gods for the purposes of monitoring and predicting rain. Within the shrine, there exists certain plants, reptiles, birds and insects that benefit from the conserved environment. The shrines are sanctuaries for nature conservation and they have been gazetted by the Kenyan government as protected shrines. The Bunyores believe that the Nganyi clan can make or stop rains, lightning and hailstorm. They take their weather advisories seriously and pay some fees to the family at the end of each season in the form of a share of their harvest. The clan perfected their rain-prediction art through observation of vegetation, trees, reptiles, birds and insects in the shrines (Gilbert, 2010). The Bunyore people and surrounding communities depend more on weather advisories from the clan than from the meteorological

department. They are widely consulted. They provide the community with information, for instance, on when to start preparing the land for planting, and when to undertake certain ceremonies such as burials and weddings. The community, which relies largely on maize farming, uses the information to make decisions that include mixed cropping of maize, beans and millet; planting of cassava and potatoes; sending some of the livestock to friends and relatives living near the lake, and drying and storing of food for use during drought periods. The clan has considerable know-how for monitoring humidity changes in the environment (Gilbert, 20110).

Nyakundi et al. (2010) investigated the traditional knowledge of flood forecasting in Nyando District, Western Kenya. The study discovered that (482 or 83%) of the respondents were aware of local ways of knowing whether a flood would occur or not and (465 or 80%) of these respondents acknowledged the use of the traditional knowledge to predict the flooding risk. These results demonstrate that local strategies are considered as a trusted source of information and of importance to this community. The behaviour of animals and the appearance and movement of birds and insects are frequently used by *Hehe* and *Nyakyusa* elders to predict weather and climate in their communities. To the elders, appearance of large swarms of red ants in September to November and the occurrence of large swarms of butterflies are indicative of imminent rainfall onset and it also indicates that the upcoming rainfall season will be good. Nyakundi et al. (2010) further observed that in both *Kilolo* and *Rungwe* districts of Kenya, the appearance of large swarms of *Yangiyangi* birds is indicative of good rainfall season and imminent rainfall onset. Also, the appearance of Pangolin (*Kakakuona* in Swahili) in September/October, which is a rare phenomenon, is indicative of abundant rainfall in the upcoming season.

Esipisu (2012) reports on how the Kenya Meteorological Department (KMD) is blending traditional forecasts with science-based predictions to produce more accurate - and more well-received weather and climate data at the local level in western Kenya (Box 2).

Box 2: Traditional and modern rain prediction in Kenya.

Kenyan farmers have relied on indigenous forecasting methods through the generations and many still consider these methods as very valuable tools – especially when used in conjunction with modern science.

The Kenya Meteorological Department (KMD) is one organization that thinks ancient practices have something to offer. Based on the findings of a study released in April 2010, it now blends traditional forecasts with science-based predictions to produce more accurate - and more well-received - weather and climate data at the local level in western Kenya.

The KMD employs satellite technology and other modern methods to produce forecasts, while the ordained rainmakers from the region's Nganyi family are asked to make their traditional predictions. Nganyi family of the Abasiekwe community in western Kenya's Emuhaya County is revered for its superior insight because it has shrines said to possess natural indicators that can give a more accurate forecast. It is widely believed that the Nganyi can make or stop rains, lightning or hailstorms.

The results of the predictions are then analysed and synthesised, translated into the Luhya language and disseminated to the public through a vernacular radio channel called Mulembe FM. Social gatherings, word of mouth and chief's meetings spread the message further. Farmers say the combined forecasts, added to their own observations, give them added confidence about what to do in the face of changing climatic conditions.

Source: Esipisu, I. (2012)

There are certain types of frogs that are used to predict the intensity of rains. Muzvidziwa (2010) cited by Muguti (2012) avers that when *mbira* (rock rabbit), squeaks in unsual ways, it heralds the imminence of rainfall in a particular area in a particular season. Also, when big and brownish frogs known as *machesi or dzetse* (bull frogs) appear in large numbers in a particular *gandwa* (water pond), it is an indicator of high rainfall patterns in a given locality (Mareverwa, 2011, cited by Muguti, 2012). Furthermore, when insects like *zviteza* begin to surface and continuously move around collecting grass for storage, it means the rainny season is imminent (Muguti, 2012). The behaviour of these insects, according to Chiondegwa (2011), cited by Muguti, 2012 is an indication that the growing season would be good so much that people are expected to work hard just like the *zviteza* insects.

As observed by Manamike (2011, cited by Muguti, 2012), another species of insects, known as *nyenze* (cicadas) usually begin to sing two or three weeks before the commencement of rains.

The Tharus of Nepal, as reported by Dhungel (2011), employ some indicators to predict heavy rainfall and flood. Among these signs are: i) abnormal crying/voices of animals and birds; ii) mobility of ants to the higher grounds; iii) chickens spread out their wings in order to dry them up; iv) increased level of river level; v) in a backside of a certain type of insect, straws get stuck. By looking at the number of straws, size of flood is assumed. One of the early warnings of coming floods is the height of nests of the *emahlokohloko* bird in Swaziland. When floods are likely to occur the nesting is very high up the trees next to the river and when floods are unlikely the nests are low down (Dhungel, 2011). Similarly, Domfeh (2007) reports that in Swaziland, flood can be predicted from the height of birds' nests near rivers.

Schmuck-Widmann (1996) studied the char dwellers in Tangail district, Bangladesh. Char-dwellers are said to possess a deep understanding of the recurrent events of flood and erosion and built up a stock of local knowledge that they use to adapt to events and mitigate against their negative effects. The Char-dwellers use a number of events to aid them in flood forecasting including: clouds drifting south – north with accompanying strong winds during the period mid-July to mid-September when water levels are said to rise greatly in a short time. Talawar and Singh (1992) cited in Chadwick et al. (n.d), observe a whole range of indigenous meteorological practices being used in Karnataka, India. Some of the reported signs are strong heat and "thunderstorms in the Bay of Bengal", body pains and joint aches, strong temperatures and fever, changes in the colour of the river, and cold air and thunder to the East are signs of the flood retreating.

The study conducted in the South-Western Highland (SWH) in Rungwe and Kilolo districts in Mbeya and Iringa regions respectively in Tanzania by Chang'a, et al. in 2010, revealed that (94%) of the respondents acknowledged the existence of traditional methods of weather and climate forecasting in their communities and 92% acknowledged using traditional weather and climate forecasts in their

agricultural activities. They concluded that local communities in SWH rely much on forecast information from IK than from conventional methods. Indigenous people in these regions employ plants, animals, birds, and insects; as well as air temperature and wind direction to predict rainfall variation. They also found that plant phenology is widely used by local communities in both districts in seasonal rainfall forecasting and that early and significant flowering of Mihemi (*Erythrina abyssinica*) and Mikwe (*Brachystegia speciformis*) trees from July to November has been identified to be one of the signals of good rainfall season.

Traditional Flood Control Strategies

A flood control measure that is unique to the traditional people all over the world is afforestation, particularly at the upper course of the river to reduce runoff. Inadvertently, this facilitates infiltration and groundwater recharge. Traditional laws and taboos are employed to sustain the forest by ensuring that houses are located far away from the water courses in the same way that the Yoruba communities in Nigeria employ taboos to protect designated forests and promote environmental sanitation and cleanliness in the urban and rural communities (Wahab, 1997, 2004, 2010). Storage of runoff in natural wetlands, detention basins, and reservoirs are another traditional way of protecting lives and properties against the menace of flood. These approaches are made possible through separation of rivers and populations via land use control. The widening or deepening of river channels to enhance capacity of rivers to contain water is also of the traditional know-how to avert hydrometeorological disasters.

It has been found that local people are using the traditional way of embankment. Dhungel, (2011) observes that the Tharus have been using Zhaala Paata (embankment made using branches of trees, various sticks) for reducing the impact of flood many years back when the monsoon season was predictable, it was enough to stop the flood from entering the village. However, in some of the places where the land cutting issues are more severe, people were found to use stones and gabion wires for embankment (Dhungel, 2011). This attests to the dynamism of indigenous knowledge. In addition to the embankments,

the communities have also managed the forest as a community forest. They believe that forests would act like a savior to them and would protect them from the hazards associated with floods. They have also made cannal irrigation for crop production as well as to divert excess water from one river to another (Dhungel, 2011).

Fowora (2013) reports that after the August 26th, 2011 flood that ravaged the city of Ibadan, sacrifices were offered to river gods (*oluweri/yemoja*) to avert flood related risks in future. The live cow used for the rituals was offered at the bank of River Ona at Apete where the bridge was washed away and at "Onigba Ketun" in Awotan area next to Apete. Despite the fact that the river had not been dredged two years after the incidence, the river has ceased to over flow, which the community people claimed to be an indication that the sacrifices were effective (Fowora, 2013).

Indigenous Coping and Adaptation Mechanisms

Effective adaptation planning relies on the best available knowledge base, and the urgent need to respond to the incidence of flooding has put a premium on the generation, interpretation and use of information within communities, regions, countries and globally. In recent years, there has been an increasing realisation that the observations and assessments of indigenous groups provide valuable local level information, offer local verification of global models, and are currently providing the basis for local community-driven adaptation strategies that are way past the planning stage and are already being implemented and tested (McLean, 2010). An analysis of soil and water conservation projects in Africa concluded that indigenous techniques should be a starting point to obtain success (Reij, 1993 cited in Stigter et al., 2005).

The continued existence of indigenous peoples is intertwined with the success of their fragile environment and its resources. Many indigenous peoples depend on fishing, hunting and agriculture for their survival – and as foods, medicines, fuels and habitats are threatened by flood, small communities are suffering particular hardships, and indigenous cultures, traditions and languages are facing major challenges to their continued existence. Indigenous knowledge provides

a crucial foundation for community-based adaptation and mitigation actions that can sustain resilience of social-ecological systems at the interdependent local, regional, and global scales.

In a vast and sparsely populated arctic landscape, persons who lack appropriate knowledge, experience and preparation may find themselves in potentially life threatening circumstances due to inclement weather, sub-zero temperatures, violent winds, rough waters and treacherous ice conditions (Nakashima et al., 2012). Arctic indigenous peoples rely on traditional knowledge to seek sheltered waters when storms arise at sea; to build snow houses when trapped by unexpected blizzards; or to seek out emergency food for their herds when mid-winter thaw and freeze lock pastures under sheets of ice. For this reason, Arctic peoples have always considered traditional knowledge about the land and associated survival skills to be of primordial importance (Nakashima et al., 2012).

Connections between flooding and disease are well established as many disease outbreaks occur during and after seasonable and unseasonable flood. As noted by McLean (2010), climate-sensitive diseases, such as malaria and dengue, are among the largest global killers, and several indigenous communities, particularly following floods, have reported increases in their incidence and range. The indigenous people rely heavily on knowledge of plants and animals' parts and compositions to cope with and possibly adapt to changes in health conditions as a result of flooding. Traditional medical knowledge does offer hope in combating the occurrence of certain diseases, and in maintaining human and livestock health, with practical examples including prevention of schistosomiasis (bilharzia) in Mali and Mauritania using local plants; and control of ticks in livestock in Ethiopia using traditional methods (McLean, 2010), as well as the prevention and treatment of rabies with local plants by the trado-veterinary healers and pastoralists in Nigeria (Wahab, 2012).

The components of food security (food availability, food access, food utilisation and food production systems strength) are affected by flood, with food production system most disturbed during and after a flood incidence. Agricultural adaptation strategies employed by indigenous peoples include adjusting crop varieties and planting dates

(such as mixed cropping in Burkina Faso or rotational cropping in the Indian Himalayas); relocating crops (indigenous peoples in Guyana are moving from their savanna homes to forest areas during droughts and have started planting cassava, their main staple crop, on moist floodplains which are normally too wet for other crops); change of hunting and gathering periods to adapt to changing animal migration patterns, and improvement of agricultural techniques (with many instances reported across Africa and Latin America (McLean, 2010).

The livelihood of many indigenous and local communities, in particular, will be adversely affected if flooding leads to losses in biodiversity. Indigenous communities are directly dependent on the products and services provided by the terrestrial, coastal and marine ecosystems, which they inhabit. Seasonal and unseasonal flooding of arable land is causing a decrease and disappearance of certain species, which means that a number of traditional livelihood activities are increasingly coming under pressure and are at the risk of being unable to sustain livelihoods. McLean (2010) confirms that indigenous peoples around the globe are reporting species loss or extinction; increasing species range shifts and wild fire risk; and coastal communities report coral mortality from coral bleaching.

As the impact of flooding on agriculture, which is the mainstay of livelihood of indigenous people, is becoming intense, it may become necessary for indigenous and traditional peoples to supplement their subsistence livelihoods with income gathering activities beyond agriculture in order to minimize their susceptibility to hazards. Examples of this in action in indigenous communities include transferring indigenous knowledge of weaving in Bani Suhilah to young women through a series of one to one practical training (McLean, 2010) as is the case in Iseyin, Nigeria where indigenous knowledge of production of *'aso-oke'* (hand-woven local textile) on the narrow-loom is taught to male and female youths by the elderly male and female weavers.

In the Khaza village south of Gaza in the Palestinian Authority sheep wool waste is being used to produce art pieces (McLean, 2010). Coping with the menace of flood, the Tharu people of Nepal, Asia have adopted a number of traditional strategies, among which are: building double

storey house, *Mizuya* (flood house) in Japan (Takeuchi, 2009), storing seeds on the upper level to avoid flood damage, rearing cattle on higher grounds, capturing upland forest land, and temporary migration upland (Dhungel, 2011). A BRAC report, prepared in 1989 highlighted the flood awareness and local coping strategies developed by the rural population in Bangladesh. According to the report, many people are known to prepare clay stoves (chula) in the month of Chaitra to be used during the flood; the raising of the floors of animals' stalls is also common practice while house construction is also influenced by the susceptibility to flood (Chadwick et al., n.d.).

Conclusion

This paper has identified local indicators that are used by local communities in seasonal rainfall and flood prediction in some parts of the world. It has been found that plants phenology, arthropods' activities, birds' migratory pattern, and the condition of clouds among others are mostly used as potential predictors for seasonal rainfall prediction across the world where people employ indigenous knowledge in their day-to-day activities. The use of environmental indicators to predict the occurrence of rain and possibly flood provides firsthand information to the indigenous people for onward preparation against the threat of flooding. This affords the indigenous people the opportunity to prepare earnestly for impeding rainy seasons and the associated phenomenon, including flood. This is against contemporary experiences when flood constantly claim lives and properties. It was also noted that varieties of strategies have been employed by indigenous people from time immemorial to combat dangers inherent in flooding. Despite modernization and global change, indigenous knowledge systems, such as the use of biotic weather indicators to predict weather, still play an important role in decision making in rural livelihoods (Shoko, 2012). However, incorporating indigenous knowledge into climate change concerns should not be done at the expense of modern/western scientific knowledge. Indigenous knowledge should complement, rather than compete with global knowledge systems (Nyong et al. 2007). Systematic documentation, quantification and subsequent integration of IK into conventional weather forecasting systems, as being currently explored in Kenya by

the Kenyan Meteorological Department, and flood control mechanisms is, therefore, recommended as one of the strategies that could help to improve the accuracy, reliability, and dissemination of seasonal forecasting information under a changing climate.

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Sacred Forests : Indigenous Knowledge and Cultural Beliefs for Conservation of Forests in Ifo Local Government Area of Ogun State, Nigeria

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Abstract

The study was designed to assess the use of indigenous knowledge in forest conservation by the local people of Ifo Local Government Area (LGA) of Ogun State. Purposeful sampling technique was used to select two villages: Balogun and Ososun in Oke-pata community, Ifo LGA. The communities were selected based on their housing of sacred forests dedicated to one god or the other. The respondents for the study include traditional rulers and chiefs, forest priests, rural dwellers and selected key informants. Seventy-one respondents were interviewed through the use of structured questionnaire complemented with field observation and in-depth interview. All the sampled respondents (100%) were aware of at least a sacred forest in their respective communities.

In Ososun community, the respondents mentioned Igbo Igunuko (59%) and Igbo Oro (41%) as their sacred forest, while all the dwellers in Balogun mentioned Igbo Oso'ro, which housed a river, believed to possess powers that heal children of their diseases. About 95.8% of the respondents affirmed that people were not allowed to extract products from the sacred forests. However, all the respondents (100%) affirmed the susceptibility of religious activities in the sacred forests. Some of the resources protected in the sacred forests are rare plants and animal species as well as the customs and beliefs of the people. Among the perceptions of the local people in the sacred forest include: the sacred forest is the foundation of the communities; the forest is a place of residence of the gods of the land, rituals done in the forests determine the productivity of the rural communities, and women and