

Indigenous Knowledge and Sustainable Development in Africa: Case Study on Central Africa

Charles Takoyoh Eyong

INTRODUCTION

Although this paper is supposed to present a case study on Indigenous Knowledge Systems (IKS) and Sustainable Development on Central Africa, it is important to briefly review the key concepts of the theme so as to give a sense of direction to readers. Moreover, the guest speakers of this conference have provided the theoretical and conceptual frameworks on the theme. This paper provides answers to the following questions: Who are indigenous peoples? What is indigenous knowledge? What is sustainable development? How do IKS reflect the principal characteristics of sustainable development? Are there any specific examples from Central Africa?

The paper argues that IKS in Central Africa have a high sustainability potential. They have over generations fostered relationships with other groups, creating a complex web of high levels of cooperation, exchange and support that are essential for sustainability. Their fast erosion due to internal and external factors poses a serious threat to sustainable development in the sub region. The lack of codification of IKS gives an urge to western pharmaceutical companies who make huge profits from indigenous knowledge of medicinal plants. The paper describes some challenges IKS face and how they can be addressed.

Indigenous Peoples

The term “*indigenous peoples*” is in itself a contested category of people; so too is *indigenous knowledge*. The former refers to “culturally distinct ethnic groups with a different identity from the national society, draw existence from local resources and are politically non-dominant (Melchias, 2001:35). The World Bank (1991) adds a development perspective by stating that indigenous peoples are “social groups with a social and cultural identity distinct from the dominant society that makes vulnerability to being disadvantaged by the development process.” The UN has no universally accepted

definition but thinks “indigenous communities, peoples and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing in those territories, or parts of them” (Cobo, 1987). There are some common grounds from these definitions.

Indigenous peoples are people living in an area within a nation-state, prior to the formation of a nation-state, but may identify with it; and have maintained a great part of their distinct linguistic, cultural, social and organizational characteristics. These differentiate them in some degree from the surrounding populations and dominant culture of the nation-state. It would make sense to note that, for this claim to be valid, others must see such groups as indigenous. Found mainly in areas where they have lived for thousands of years, indigenous people inhabit nearly a fifth of the planet. Contemporary discourse on who is an indigene has led to the talk of “autochthones” that are indigenous inhabitants and “non-indigenes”, or migrant settlers. However, this distinction is very politically laden, especially in the Cameroon context. The cloudy atmosphere surrounding the definition of indigenous peoples also explains the variance in estimates of their numbers. Estimates show that between 300 and 500 million indigenous peoples speak a vast majority of world languages and represent the majority of cultural diversity (Melchias, 2001) we must preserve for posterity.

Indigenous Knowledge

Indigenous knowledge on its part refers to what indigenous people know and do, and what they have known and done for generations – practices that evolved through trial and error and proved flexible enough to cope with change (Melchias, 2001). This definition draws our attention to the colonial racist idea that indigenous knowledge is a monopoly of *trials and error* while western (modern) knowledge is *science* characterized by *experimentation*. Hence,

while the former is presumed clogged, concrete, and inaccurate, the latter is painted as intangible, weighty, right, and imbued with universal reasoning. IKS were also developed by experimentations though these experiments were not documented and the knowledge systems were legitimised and fortified under suitable institutional frameworks, culture and practices. They have been passed on to other generations (though discriminatorily) and have enabled indigenous people to survive, manage their natural resources and the ecosystems surrounding them like animals, plants, rivers, seas, natural environment, economic, cultural and political organization. Knowledge of these elements form a set of interacting units known as indigenous coping systems.

For this study, IKS refers to the set of interactions between the economic, ecological, political, and social, environments within a group or groups with a strong identity, drawing existence from local resources through patterned behaviours that are transmitted from generation to generations to cope with change. These patterns are sustained by micro level institutional arrangements vested with differentiated responsibilities that ensure the group's continuous survival.

Unfortunately, these systems are fast eroding due to colonialism, commercialisation, globalisation and modernisation, lack of efficient codification, breakdown of the traditional family structure and function (the institution that helps in the socialisation of tacit knowledge), developmentally induced human displacements, the decline in the practitioner base and many other reasons.

Sustainable Development

Sustainable development on its part is a fluid concept that is relatively new in the development discourse. It was first mentioned in the work of Leister Brown (1981), and six years later the Brundtlandt Commission defined it as "development that meets the needs of the present generation without compromising the ability of future generations to meet theirs" (WCSD, 1987:8). Such a political definition fails to give concrete sustainability benchmarks. Despite more than half a century of development cooperation, very little has been achieved because the donor community thought sustainable

development in developing countries means higher gross domestic product growth rates. They are failing as we all now mimic the American throwaway culture, as well as that of mass production and mass consumption that characterize a wasteful and highly polluting lifestyle. Today, the earth is so polluted that the very survival of humanity is threatened as evidenced by silent emergencies like desertification, fast degradation of arable land due to abusive and inappropriate use of fertilizers, polluted rivers, air and soil caused by industrial effluents (Eyong et al., 2004). These are speeding the process of biodiversity loss. The loudest emergency the world has to deal with is global warming but so far coping mechanisms for safeguarding our common future remain inadequate. The life support systems of the earth (seas, rivers, oceans soils, forests and air) can be likened to a boat; any leakage on one part of this boat will cost the entire boat and not only the affected part. Co-operation at all levels by all including indigenous peoples with differing knowledge systems, is needed to protect the earth's life support systems and to meet present development needs whilst keeping in mind those of future generations need these life support systems. The idea is to transfer enough natural capital to future generations. Hence, capital bequest is an intergenerational contract for sustainability based on ethics because so far no strong legal framework exists to hold deviants accountable for their actions. Protection of the earth's life support systems requires all sorts of knowledge and coherent information. The absence of this explains why imported western models and technologies have failed in alien settings. The so called 'experts' should try to understand the people they intend to help and should take indigenous knowledge and perceptions into consideration rather than denigrate and relegate them to the background in development interventions.

A practical definition of sustainable development should contextually take into consideration issues of cooperation, stakeholder participation, commitment, long, medium and short term effects of current actions, common concerns, inter and intra generational equity, justice, and moderate production and consumption habits. It requires efficient communication, tacit knowledge and its transfer between and within generations, capacity and willingness to act based on the knowledge available. All these are embedded in the coping

mechanisms of indigenous peoples of Central Africa. However, they are under threat due to the cruelty of colonialism and other current development interventions. The next section describes the area on which this case study is focused.

DESCRIPTION OF CASE STUDY AREA

This paper presents a case study on the role of IKS on the sustainable development of Central Africa. This geographical area includes colonial products like Cameroon, Central African Republic, Chad, Congo Brazzaville, Democratic Republic of Congo, Equatorial Guinea and Gabon including Sao Tomé and Príncipe (Fig. 1). Their common ground is that they lie within 20 and 30 degrees north and south of the equator. These countries also possess valuable mineral resources that are largely exploited by foreign companies while open conflicts are ravaging the fragile economic growths that they recorded in the 1990s. They are relatively vast, with fast disappearing primary and gene rich tropical forests. The area is endowed with an enormous diversity of animals and plants, both domesticated and wild, and an impressive variety of habitats and ecosystems that sustain the food, medicinal, clothing, shelter,

spiritual, recreational, and other needs of the people. This biodiversity ensures the essential ecological functions on which life depends, including supplies of clean water, nutrient cycling, and soil maintenance.

Tropical rainforests are home to indigenous pigmy communities of about 50,000 Ba'Aka pigmies. 30,000 live in southern Cameroon, 15,000 in northern Rep. of Congo and about 5,000 in Gabon. They for centuries have had meaningful exchanges and a symbiotic relationship with ethnic groups like the Bantu farmers. These pigmy bands live in cultural or ethnic groupings often located in areas geographically distant from urban centres. They function at the periphery of the political, social, cultural, and economic systems of the dominant or mainstream society and are mostly visited by agents of the dominant state during election times. Since the colonial times, the various states have tried to settle them near to a road as well as prohibit their access to forest and their mobile lifestyle. Different catholic missions are also reported to have tried to gather the Ba'Aka around specific "pygmy missions" to offer them health care, education and religious indoctrination (Schmidt-Soltau, 2005). They are the forgotten of the area in terms of enjoying the

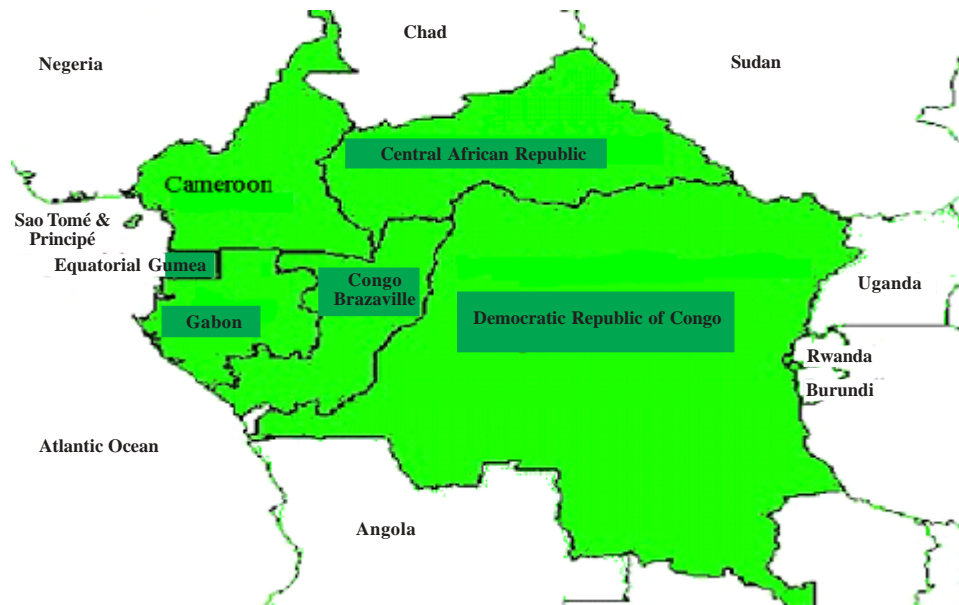


Fig. 1. Map of Central African Region (Adapted from <http://www.worldwildlife.org/bsp/publications/africa/125/125/CentralAfrica-Maps.HTML>)

benefits from the ecosystems they have preserved for centuries; the treasure house from which future food needs, cures for deadly diseases, and elements for knowledge and technology will be found (Emeagwali, 2003). Instead, they get kickbacks in the form of forced relocation because they are seen as being in the way of development and their strong cultural attachment is seen as a development barrier (Crewe and Harrison, 1998) rather than as a positive contributor to nature conservation.

METHODS

While this work remains chiefly a product of critical literature review, it is spiced with data from loosely structured interviews with a group of 10 men and three women older than 50 in an Anglophone village concluded in Cameroon in June 2005. The idea was to find out why indigenous knowledge is selectively and discriminatively handed down to younger generations. The informal nature of the discussions made it possible for probes and flexibility as informants could express themselves freely. Copious notes were taken that were later transcribed. An expert in forced relocation and a World Bank consultant of German nationality was consulted. He provided information on the situation in the Central African Republic. Personal observations from lifetime practices helped generate data on IKS. The obvious questions is why IKS?

INDIGENOUS KNOWLEDGE AS AN ENGINE FOR SUSTAINABLE DEVELOPMENT

Every society has a history behind its knowledge resources, which guides its development process. Time passage and contact with others affect knowledge systems as well as a society's development. African IKS are holistic in nature and centuries of tight bonds with an environment, produces a deep understanding and not snap shots of the inter-relationships among the different elements of a habitat. Doctored and undoctored surveys show that they perform well in risk avoidance and management, ecosystem maintenance and human health. They have linkages and guidelines for social equity, relationships with non-human beings, ecological responsibility and respect for the super-natural. Environmental changes are best countered by diversified indigenous survival strategies and

adaptive responses, developed at intra and inter-household as well as community levels. Currently, due to specializations, people in the region now know more about some and less about others, which makes coping with the complexity of ecological change difficult.

Another issue is the change from extended to nuclear families that is weakening links with the grandparent generation that holds much knowledge and the second filial generation is alienated from IKS due to the huge power of *modernity*. Central African education planners have lesser esteem for this knowledge in school curricula and the transition from oral to written culture is seeing most of the knowledge being lost. Lack of trust and unwillingness of many elderly herbalists to share their knowledge or agree to its transcription, or to transcribe it themselves is also worrying. In a way, this can be understood because bio-prospectors have extracted the local knowledge in the area, commercialized it or published it without any attribution, reciprocity, or benefit sharing and thus have offended a province of indigenous healers and local communities.

Knowledge erosion is a threat, as it becomes not only difficult to conserve what we do not know. Hence, the option values decline if the probability of finding a resource useful in the current generation is lower because of the loss of knowledge about the resource. Conserving biodiversity without conserving associated knowledge systems is just a short-term sustainability solution, as future generations will not benefit from centuries of experimentation and knowledge accumulation by indigenous peoples. Most advances made in the discovery of new drugs from medicinal plants have been the outcome of indigenous knowledge. Recombinant DNA research originated from indigenous people choosing and selecting seeds. While the bases on which different communities in the region have classified and organized their knowledge and practices are complex and dynamic; a detailed and committed documentation with little errors is needed now before it is too late. Development cooperation should provide the money needed for this global project while the results should be patented or restricted so that access should not be without a fee for knowledge providers.

The economic rationale behind the talk about indigenous knowledge is that its regulated access and use, including a compensation scheme, can

help to ensure cultural and biological diversity since the global annual world market profits of medicines derived from plants is estimated at over 43 billion US dollars but sadly enough, indigenous people receive only 0.001 percent of this amount (Melchias, 2001). Tapping into the intellectual resources and increasing the economic value of IKS is a viable tool for sustainable development in the region. Hence, it is at the level of economic sustainability, self-reliance and cost effectiveness that IKS continue to prove their viability and strength. They are part of the second economy dominated by small-scale producers, manufacturers and bankers and part of the most vibrant sectors of economies at this present time. In some cases, IKS contributes more than half of total economic growth. Operatives in this sector like metallurgists, textile manufacturers and food processors tap into the accumulated skills and expertise of IKS in the region.

SOME EXAMPLES OF INDIGENOUS KNOWLEDGE SYSTEMS IN CENTRAL AFRICA

The following section describes many knowledge systems that are still utilized in mostly rural and reluctantly in urban communities in Central Africa. They may be common practice in many parts of Africa as will be seen in certain sections of this paper. While some systems have undergone change over time, others have been revived in more recent periods or have fallen into oblivion.

Indigenous Healing Practices

Currently, over “80% of the world’s population depends on indigenous healthcare based on medicinal plants”. Indigenous people employ at least 20,000 plant species for medicines and related purposes (Melchias, 2001). Central Africa is very rich in medicinal plant species; an example is Mount Cameroon. Studies have confirmed that medicinal plants used in the region are as efficient as the imported “Western” prescription medicine (Nkuinkeu, 1999). The World Health Organization recognizes this enormous contribution because sustainable development rests on a healthy population. Indigenous medicine or mind-body medicine is holistic and tends to treat patients in their totality by also giving answers to the ‘why’ question often asked by indigenous Africans. For this aspect let us focus on the ‘health-seeking

behaviour of Africans. When sick, they knowingly or unknowingly go through a series of judgments. The first thing is to be convinced that one’s health has deteriorated and needs care. The next decision is where to seek care. At this stage, the “why” question comes in. Why me, why at this time, place, day and date? The many why questions mean no scientifically proven answer will be satisfactory since modern science and technology deals with the how and what (mechanics). The obvious decision is to consult a witchdoctor, shaman, sooth sayer or traditional healer for diagnosis and cure. This explains why their knowledge is important and often linked to a group’s cultural and religious values. So the health seeking behaviour (HSB) of the culture-rich people of Central Africa is a function of their ‘belief, perception and evaluation’, which is deeply rooted in their culture (*HSB (f): belief, perception and evaluation = culture*). Traditional medicine diagnoses the cause and symptoms are treated. It is advantageous to modern western health care because it goes beyond the physical body (germ theory) into the spiritual realm. Biomedicine based on the germ theory that germs are major causes of diseases views the body mechanistically in terms of individual parts, a reductionist approach. Indigenous healing practices in Central Africa have some common principles and procedures utilized in modern medicine like hydrotherapy, heat therapy, spinal manipulation, quarantine, bone setting and surgery. Incantations and other devices of psychotherapeutic dimension are often applied. Treatment for cancer, obesity, drug addiction, diabetes and other ailments have benefited directly and indirectly from indigenous healers through plants such as the *iboga* as it is known in Cameroon and Gabon.

It is with thanks to indigenous knowledge that the California based Shaman Pharmaceuticals were founded in 1989 with the goal to commercialize indigenous pharmaceutical uses of plants. As if that is not enough, other western-based pharmaceutical companies often send agents to tap the knowledge of indigenous healers in the region and today billions of dollars are paid to botanical gardens to research on plant varieties and species that can benefit pharmaceutical companies. Major botanical gardens in the area like Limbe Botanic Garden for Cameroon, Eala and Kisantu Botanic Gardens, Democratic Republic of Congo, cooperate with partners from the developed world and this partnership forms the

pipe through which indigenous knowledge is drained. The Limbe Botanical Garden and North Carolina Zoological Park is one of such examples. Research claims have seen many indigenous species leaving the region illegally to the west. It is only fair to ask why there are more botanic gardens in the gene poor Europe than in the gene rich Africa. For instance, with only 11,000 plant species, Europe has over 11 times more gardens compared to Africa which has over 30,000 known species of plants. Currently, pharmaceutical companies are relying more on modern technology than on indigenous communities. The bitter pill Shaman pharmaceuticals had to swallow was bankruptcy in 2001. So, indigenous knowledge is economically viable for companies.

Knowledge of Plants and Animals and their Uses

Indigenous peoples in Central Africa have extensive knowledge of plants and animals that have a multi-purpose use at the local, national and international levels. The economic value of these plants is very high on the world market, an important source of income for a region suffocating from high poverty and debts. These plants are used as food and medicine for many diseases. An example is *Gnetum africanum* and *Gnetum buchholzianum*, which have different local names but essentially the same uses. In Central African Republic, Gabon, Congo and the Democratic Republic of Congo, the two species are locally called *koko* while in Anglophone and

Francophone Cameroon, they are known as *eru* and *okok* respectively. They have a medicinal as well as food value and constitute an important source of protein, essential amino acids and mineral elements. Their leaves can be eaten raw or sliced in thin shreds and added to soups and stews. Medicinally, in the Ubangi area in the Democratic Republic of Congo, gnetum is used to treat nausea and is considered to be an antidote to some forms of poison. In Congo-Brazzaville, the leaves of both species are used as a dressing for warts and boils and a tisane of the cut-up stem is taken to reduce the pain of childbirth. Increased commercialisation of gnetum is rampant in the region, particularly in Cameroon where the leaves are harvested on a daily basis and sold in local and regional markets. This is speeding the extinction of these plants; as it is hard to find them in nearby forests. Commonly used medicinal plants are sourced from secondary forests, the edges of paths, farms, village peripheries and informal gardens kept by specialist healers. Species used for more severe illnesses also considered as most powerful, are sourced from high or secondary forest (Shiembo, 1999). Table 1 presents some examples.

Table 1 is just a short list of the many local uses of plants in the area. While most are used as food, for shelter and decoration, they all have many different medicinal values which help to increase their economic, cultural and social importance. Realizing the enormous importance of indigenous knowledge of plants and animals,

Table 1: Selected Plants and Their Indigenous Uses in the Central African Region

<i>Scientific/common name</i>	<i>Part of plant used</i>	<i>Medicinal uses</i>
<i>Pterocarpus soyauxii</i> (padouk, or camwood)	Ground stem	Child birth, marriages
<i>Milicia excelsa</i> (Iroko)	Most sacred tree species	Sacrifices to appease gods
<i>Nauclea diderrichii</i> (bilinga)	Bark, root, and wood or trunk	Fevers, stomach problems
<i>Canarium schweinfurthii</i> (aiele)	Fruits, popular in local markets	Resin is burnt as incense start fires or as "bush candle"
<i>Lophira alata</i> (azobé or ironwood)	Trunk	Medicine for back pain, toothache
<i>Costus afer</i>	Stem and juice	Coughs, sore throats, eye infections
<i>Emilia coccinea</i>	Entire plant	Anti-poison, jaundice, snakebite
<i>Eremomastax speciosa</i>	Leaves	Purify and strengthen blood
<i>Aframomum spp.</i>	Leaves	Spice for food, coughs, magnifiers in medicinal mixtures
<i>Piper guineensis</i>	Leaves	Spice for food, treat hangovers, stomach problems, build strength
(<i>Garcinia kola</i>) Bitter Kola	Seeds	Digestive agent, poison antidote, protects microsomal enzymes against phalloidin
<i>Bush Pepper</i>	Seeds	Mix with others to treat cough, chest pain spleen for children

Source: Eyong, 2003; Shiembo, 1999 and Dijk, 1999

Shaman Pharmaceuticals collaborated with 58 traditional doctors from 7 provinces and 42 communities in Guinea between 1994 and 1998. As a result of this, 145 plant species were identified as useful for the treatment of type II diabetes mellitus (Carlson, 2002).

INDIGENOUS AGRICULTURAL SYSTEMS

Since time immemorial, indigenous peoples in Central Africa have developed and applied several farming techniques and have orally passed them from one generation to the next. These activities take place during different farming seasons and periods. They may not be applied uniformly in grasslands and in forest areas but the general principles are the same no matter the country. They present an enormous wealth of knowledge to be tapped in our quest for sustainable agriculture. This knowledge spans from clearing the land, tilling, selecting seed varieties for planting, planting, harvesting and storage. Since the intention is for household subsistence, farm sizes are generally small, varying from 1 to over 5 hectares and in some cases social surplus is generated.

Shifting cultivation, crop rotation, mixed cropping, farm fallowing and the slash and burn type, characterised by smallholder production, dominate. These systems are viewed as inimical to the survival of wildlife and even where they exist, agriculture extension workers have discouraged farmers from such practices. While these accelerate forest transformation from primary to secondary, this does not surpass the regenerative capacities of the forest. Ending human activities such as fires and shifting cultivation reduces biodiversity, because they create the patchiness of the terrain that encourages more species to survive. For example, pulling out the human component and maintaining too many elephants, is most likely to cause biodiversity loss (Lamb, 1997).

Mixed and inter cropping is a common and advantageous system. Usually, leguminous plants are intercropped with other crops. Leguminous plants are also planted during the fallow period in a bid to enrich the soil. They fix nitrogen by harbouring nitrobacters in their root nodules. Common crop rotation is beans, *Ipomoea* spp, maize, groundnut followed by planting of cassava, taro, yam tubers etc. Small-scale farming to meet domestic needs lacks the potential to destroy entire forest ecosystems, the situation is

worsened by huge multinationals hastily clearing down primary forest and quota bursting to make huge profits. When the forests are left bare, bush fires grow wild. Hence, grass burning in tropical forests is a way to increase soil fertility and is considered safe as long as they do not generate bush fires and since rural population densities are low (Begossi, 1998).

There are some indigenous cultivation practices, which conserve soil and water and increase soil fertility for increased crop production in the area. They depend on manual labour often provided by the extended family system or self-help groups on a rotatory basis in operations ranging from clearing or slash and burn, hand hoeing, seedbed preparation, weed control and harvesting. There is sufficient information on how the farm plots are prepared but there are many different tilling practices over the centuries that can be seen to be sustainable. *Ridges* (with or without imbedded organic residues) are widely used in the region to grow vegetables, maize, groundnuts, round (Irish) potatoes and sweet potatoes, taro species, legumes and many others. On plateaus, some farmers make flat top ridges and on hilly areas round-top ridge systems are used. Contoured ridges prevent soil erosion and retain some moisture that is good for plant growth (see Kayombol et al., 1999).

Trash lines formed by placing crop residues in lines, across the farm plot are widely used. They impede runoff, enhance infiltration if carefully and effectively done. Mostly, trash lines are constructed from sorghum and millet clovers that are slow to decompose and are of lower palatability to livestock than maize clovers. They are destroyed by ants and termites and can withstand deluges of water. Since they are permeable they leak water. Decomposition of trash line material increases soil fertility. In primary forests, *log lines* are common on recently cleared farm plots. Tree trunks on the ground are used to make lines, which may be filled out using crop residues or weeds. Due to competition between log lines and charcoal production for sale to street vendors who roast fish, maize, plantains and meat, a shifted interest on strong wood to lines are being constructed from softwood, with low economic value. However, if hardwoods are burnt then after the terrace has formed, the charcoal is sold. Termites and ants also destroy log lines. Semi-permeable *earthen bunds* that allow water to pass through but retain soil are used in some areas. Cultivation on the

inter-bund areas leads to formation of natural benches over time. These techniques are also widely used in other regions of Africa. In other cases, *retention ditches* are used in steep areas to capture runoff and allow infiltration for crop roots to tap. Also, stone and earth terraces are used to protect and increase cultivated land. *Composting* plant residues and addition of animal manure like cow dung continuously revamp the land's fertility. The resultant high content of incorporated organic matter increases soil fertility and promotes rainfall infiltration. *Mulching* is used to conserve soil and water, to maintain soil fertility and to reduce weed growth.

Three mothers in South west Cameroon were asked what makes them know that soil fertility is declining and the response was poor yields. They could also feel from the leaves of the plants as they grow on the fields. Sometimes, the remedy is wood ash from kitchens or manure from waste from livestock. These biodegradable fertilizers have little adverse effects on the food chain compared to chemical fertilizers. Today, villagers apply nitrogenous fertilisers to cash crops like coffee, cocoa and banana and hardly to food crops. Often, locals complain that food grown with fertilizers does not taste good. We know full well that toxins from chemical fertilizers enter the food chain and have been proven in toxicological studies to poison systems and organs of the human body. Unfortunately, these non-biodegradable growth-enhancing substances that modern agricultural experts force poor people to use are potential human poisons.

At face value, we could decry the fact that the lack of food storage facilities is a main cause of food insecurity. It might be important to note here that indigenous techniques exist but these are mostly able to serve the domestic group and not for commercialization on a large scale. Traditionally prepared bands and bush sheds have served as food storage places throughout seasons. Sometimes, collected seeds are stocked in walls of houses, maize is smoked in kitchens as well as some plant species are used to keep away weevils in addition to many other storage techniques. Besides, farmers who feed urban populations are surprisingly the poorest in Cameroon (Eyong, 2003b).

Food Habits

About two generations back, life expectancy

was far longer than what obtains today in Central Africa where people lived up to between 70 and 90 years before dying. Part of this can be explained by the food habits of the people. Mothers were not used to cooking without mixing vegetables, protein and other vital nutrients in soups capable of forming a balanced diet. They never went to school to study how to prepare a balanced diet. It was a habit for people to eat a fruit even after a meal and the fruit trees were at the immediate surroundings of the house. Today, even with improvements in healthcare, knowledge and purchasing power, people eat much unbalanced diets. Malnutrition is rampant killing as much as, if not more than HIV/Aids is doing in the region.

Disease Vector Control

A good example of the use of African indigenous knowledge to address global health and environmental issues is the widely known endod (*Phytolacca dodecandra*). Endod has a disease vector control property, controlling schistosomiasis, a tropical disease transmitted by freshwater snails. This low-cost and biodegradable molluscicide has been hailed as a major scientific breakthrough controlling schistosomiasis endemic in 76 countries in tropical Africa, Asia and Latin America that has resulted in some 200,000 deaths per year. Often non-biodegradable chemical molluscicides have been used at exceeding costs. An example is Bayluscide, manufactured by the Bayer Company of Germany, which sells at about between 25,000-30,000 dollars per ton (Rural Advancement Foundation International, 1993). Endod is an indigenous technology that came to the rescue of industrialized nations, effectively preventing zebra mussels (*Dreissena polymorpha*) from clogging water intake pipes in North American waters since the early 1990s.

This best-known perennial African soapberry has been selected and cultivated for centuries by many indigenous Africans, who used its berries as laundry soap and shampoo. It is a broad spectrum intoxicant used to catch edible fish, used for skin itching, abortion, gonorrhoea, leeches, intestinal worms, anthrax and rabies.

Indigenous Conservation Techniques

Indigenous peoples of Central Africa's biodiverse regions hold important knowledge for sustainable livelihoods and biodiversity conser-

vation. Recognising this, two-thirds of Dzanga-Sangha National Park is now classified as a “Special Reserve”, a new type of protected area in the Central African Republic, which enables the Ba’Aka pygmies to remain in the reserve and maintain traditional lifestyles. Within the reserve, pygmies retain the rights to hunt and gather medicinal plants, fruit and other wild foods. Certain species such as elephant, gorilla and chimpanzee cannot be hunted as these are protected under national legislation. Ba’Aka pygmies have developed a strong awareness of the seasons and moods of the forest and how they influence plants and animals. The knowledge accumulated over generations is being put to use in managing the reserve and its wildlife. Some pygmies are employed as research assistants for ecological studies on elephant, gorilla and medicinal plants. Sharing their knowledge contributes to a greater understanding of the often-fragile links within the forest ecosystem, and is invaluable for planning and management purposes. Also, the pygmies appreciate that their accumulated knowledge is important in the ‘modern’ world.

This section provides examples of traditional practices of biodiversity conservation from the Korup National Park area in Cameroon uncovered through formal and informal interviews with members of a relocated village between 1999 and 2006. The belief is that traditional and folk methods of conservation work better than forced relocation (Eyong et al., 2004). These methods include:

a) Hunting Habits: Hunters are cautious that not too many people hunt in one area at the same time for safety reasons. Hunters respect areas for trapping reserved for them in the forest since hunting with guns is considered to be dangerous when too many hunters act too near to each other in the same forest. Hunters try to avoid young animals and pregnant ones because they are not yet big enough to be eaten or sold. Such common sense habits are positive contributions and need to be encouraged. In the rainy season, hunting with guns is restricted and only minimal trapping is carried out. These attitudes are seen to be positive for the animal population since there is limited disturbance in the forest over a period of about six months.

b) Sacred Forests: The existence of restricted areas or sacred forests makes certain sections of rivers and streams to be declared sacred. No fishing or hunting is carried out there, except

ordered by the sacred society. Important and expensive rituals are performed to mark an important event and only members of the respective sacred societies are allowed access to such parts of the forest.

c) Cultivation Habits: Forest dwellers grow fruit trees on their farms and around the village. In this way, harvest is more effective. The way the villagers collect and harvest non-timber forest products (NTFPs), like nuts and fruits, are not damaging to the plants. Generally, farm sizes are small (on average, less than one hectare per household) because the people cultivate to meet their domestic needs and not for sale. This implies that only a very small social surplus may be generated.

d) Control of Foreign Exploiters: Local people in the Korup forest of Cameroon have been granting access to foreigners, especially from neighbouring Nigeria, in exchange for a token and as a sign of brotherliness. This attitude changed due to the general feeling that free access was exchanged for kickbacks. Youth groups regularly monitor and report to village councils about the presence of foreign exploiters. Women lamented that game guards cannot effectively keep away Nigerian poachers due to their limited knowledge of the entire boundaries of the park, footpaths and their relatively small numbers. With the relatively low prices paid for forest products at source, the villagers have to exploit more in order to make enough money to meet their educational and health needs.

e) Food Taboos: Respect of food taboos is a cultural ritual that binds members and is crucial for the smooth functioning of society. Ill-health is in most instances associated with non-respect of a taboo, causing ancestors to be angry and to punish the victim by inflicting some mystical pain or ailment. Serious cleansing ceremonies are often performed to heal the sick. Today, the youth especially find no reason to respect taboos since they did not become sick after eating a forbidden food. This group forms the most highly educated segment of the village. Most tabooed animals are totems and when owners of these totems die, the animal in the forest dies. Killing these animals during hunting is very difficult and a mystery. Christianity is denying the respect for taboos as sacred society membership is no longer compulsory. Pregnant women do not eat certain types of snakes, chicken in the company of men, duikers, etc. Some do not eat chimpanzees, eggs,

elephant, fox, leopard, dog, pig, etc domestic animal. Pregnant women did not eat liver, alligator or duikers because this might stop production of breast milk. Still, other women do not eat certain animals like bush baby, fox, animal parts like the head of a pig, deer, or even a tortoise, because they are believed to cause foetal abortions. There were also numerous personal taboos and men mostly do not adhere to food taboos. Some men may not eat specific animals because of membership in a traditional association. These taboos coupled with the fact that hunting is a risky venture are good for conservation.

f) Knowledge of Forest and its Resources: The people of Korup in Cameroon have a great knowledge of different plants and animals in their forest. They rely on leaves, roots and barks of trees for medicines, animals for food and cash income and other forest products. Hunters have been integrated in bio-monitoring surveys carried out by independent researchers for the Korup Project. A good example is the discovery of the medicinal vine, shown to be active against the HIV/AIDS virus. A joint team of local healers and a research student collected medicinal plants from the forest. In an open meeting, each healer described the symptoms that each plant can cure. The vine was later tested in the laboratory and discovered to be effective against the replication of the HIV/AIDS virus. However, the publications of this discovery make no mention of the input of local healers. Conversations with the people also revealed a sound knowledge of tourist attraction sites in the park.

Pigmy communities in Central African Republic have also realized that current levels of hunting are not sustainable, and so they are helping to reduce pressures by supporting the establishment of a no-hunting zone in the Dzanga-Ndoki area. This move helps to reduce threats from bushmeat hunting, an activity largely sustained by outsiders working with logging companies and diamond mines. In return, the Ba'Aka are employed by a Project agency as tourist guides, sharing their understanding of the forest with foreign tourists. Through a revenue-generating mechanism, 40 per cent of all tourist receipts go to a village association, including the Ba'Aka people, while 50 per cent pays the salaries of local employees of the park and reserve. In this way, 90 per cent of the conservation dividend goes to the local people most affected by the park and reserve as compensation for their knowledge.

Indigenous Governance

Objectively, governance in the region in pre-colonial times centred on the family and a community's resource base, including leadership, kinship, religion, occupational associations, indigenous doctors, markets, diviners, and village labour task groups bound by duties and obligations into a community (Anani, 1999). Such communal and social cohabitation lead to the development of systems of communication as well as a care system based on kind. In a typical Cameroon village, all members of an extended family support the education of a family's son or daughter who is expected to care for other members in return and when in need. Everyone is considered brother, sister, mother, father, aunt or uncle as the case may be. Also, conflict between individuals is handled at the community level since conflict is seen as destabilizing community peace. Indigenous communal leaders do not only excel in various art forms, but their governance projects are aimed at the collective improvement of their peoples (Boon and Eyong, 2005). In many cases, secular laws are regarded as sacred, a commandment of the gods embodied by the elders and priests. Social formations are structured around communal cooperation on the basis of kinship ties and respect to various deities, which essentially preclude the type of abomination that often results in excommunication and/or abandonment of family members to their individual fates like during colonialism (Kalu, 2004).

Indigenous governance structures in Central Africa revolve around Chiefs, Fons, Sultans, Council of Elders, and other social structures. These can be found in different parts of Cameroon today though most are losing the respect they once commanded. Colonialism destabilized and erased most of these structures in replacement with largely foreign, exploitative and centralized systems. Today, most chiefs are rulers instead of being leaders. Even at the local level, Central Africa is yet to produce leaders with greater capacity for rural mobilisation, organisation and communication. At the level of the nation-state, the colonial and hand-picked puppet rulers after independence became dictators pretending to consolidate their national projects. They have today rushed to embrace 'good governance' to appease donors. There is a fracture between the global imperatives of modern administrative systems in the region and the local-level rural

systems for livelihood management. Indigenous governance systems that foster place-based consciousness of how human interactions are organised for livelihood activities have been marginalized, ushering a crisis of legitimacy of the rural and national leaderships essential for mobilizing and organising resources for sustained livelihood activities (Anani, 1999). Laughingly, democratic governments in the sub-region are yet to win the confidence of their peoples and to avert wars. Hence, indigenous governance should not have been totally denigrated in the first place since they have specific implications for democratization, community empowerment, nation and capacity building, and sustainable development in the region.

Indigenous Early Warning Systems

The 21st century has faced unprecedented dangers and disasters and humanity had to devise coping strategies as well as develop early warning systems ranging from reading natural signs to the most urbane warning systems based on formal science and technologies. Indigenous societies of the Central African region relied on people with specialized powers to read natural signs and predict an event and subsequently warn the villagers. These people offered their services for free and in some cases, payments comprised of non-timber forest products. For example, a 70 year old man in North western Cameroon revealed that in his generation, when dogs cried too much, fowls crowed at mid-day, ants and flies moved in an unusual way, signalled that a nearby river would overflow its banks and destroy crops. The village would offer important sacrifices or be prepared by strengthening their coping strategies. Poor harvest, famine and other epidemics have been detected and reported before they occurred. Mount Cameroon's eruptions have been continually predicted in this way. Today, much sophisticated and expensive western early warning signals are installed in communities that need them but are under-utilised due to their lack of credibility, complexity and sensitivity. When people read signs and the event did not occur in the predicted magnitude, people tend to shy away from modern systems when future warnings are signalled. It also explains why more people are vulnerable and non-resilient when a disaster strikes today.

CHALLENGES FACING INDIGENOUS KNOWLEDGE SYSTEMS IN CENTRAL AFRICA

The Cruelty of Colonialism

IKS have suffered for decades from several strategies of disinformation embedded in western centric, colonial and post-colonial education and western religion, science and technology. Today, these systems form a bulk of selective omission of non-European achievements, inventions and technologies in academic works. Often, data on IKS are distorted to confirm the hypothesis of non-Africanist scholars. Surreptitious naming and several other strategies of all forms of colonization accompany these. Consequently, what we know about Africa today stems from the ideologically coloured glasses of 'prejudiced' colonial anthropologists who documented African cultures as raw, uncooked, primitive and uncivilised in a bid to justify the high-handed colonisation scramble (Eyong et al., 2004). The idea was to justify the content of the colonial project of total reformation of native minds as it sought to empty the brains of Africans of all forms. Essentially, it was a big scheme to deny Africa of its rich history, culture and wealth of knowledge. Hence, by a kind of perverted logic, colonialism "turns to the past of the oppressed people and distorts, disfigures and destroys it" (Boon and Eyong, 2005). It is widely known that, colonialism largely inhibited the development of indigenous technology in Africa and de-stabilized some of the existing processes of technical growth and the indigenous manufacturing capability was deliberately undermined to facilitate European exports. Deliberate laws were enacted that justified all these actions.

Economic Challenges

Colonialism transformed relatively self-sufficient indigenous people to dependent consumers through the shift to a cash crop economy, many subsistence farmers abandoned the production of food crops to farming cash crops. But in the 80s and 90s when cash crops were no longer bringing in the much-anticipated cash, hunger, disease and misery became the mainstay of formerly self-sufficient peasants. It is in this light that we can say colonialism is a root cause of food insecurity

in Africa. Colonialism created captive markets that encouraged the dumping of goods. Supported by policies such as “the scrap iron policy” of Britain, African markets were flooded with cheap mass-produced textiles, glass and iron products. Among the first groups to feel the impact of the invaders’ new laws and activities were metallurgists, including blacksmiths who forged iron and whitemiths who worked with lighter metals such as tin. Blacksmiths were depended on very much by farmers for implements. This system of internal self-reliance changed to external aid dependence. It is interesting to note that practitioners of indigenous medicine were confronted with unjust laws leading to fines, banishments from their native land, imprisonment and brutal executions. Clearly, colonialism is largely responsible for the destruction of traditional culture and deprived colonies of their past and restricted their future economic and sustainable development.

The Effects of Globalisation, Modernization and the Networked Society

Accompanying rising levels of hunger, poverty, malnutrition, environmental degradation and rapid spread of HIV/AIDs and the destruction of livelihoods, is the fast globalising world that is throwing up new challenges at an unprecedented rate. Globalisation, modernisation, market economy, rapid technological changes, and the digital divide are pounding hard on progress that was made by indigenous coping strategies with respect to development challenges. Today, the information economy is a reality and the idea that those who have the information and knowledge should have the money is still rhetoric in the African context. Taking the Internet as an example, Central African countries continue to be rather information recipients than information givers, with very few government websites containing just contact information, news, text-only versions and a few hyperlinks (Polikanov and Abramova, 2003). Angola, Algeria and Egypt have sophisticated sites aimed at developing the tourism industry, attract foreign investors, and also to promote a good image of the state to the international community. The mass media, mostly the western media, have often represented the sub-region as one flooded with wars, song and dance but very little about its rich culture and wealth of knowledge. Funded by western governments, they represent western

values and models that are often uncritically copied. Today, the level of mimicking of these values is unbelievable in the sub-region. Talk to any Central African about how your grandparents used to make rain, and you will be seen as the most backward person on this earth. But western science can also produce rain. So our mindsets are so corrupt that any meaningful change has to start with reorienting individual minds.

Without the promotion of local content, western media will destroy indigenous culture and deprive the region of its past and restrict future cultural development. IKS are fast dying out, partly due to the drive to accumulate wealth and commercialisation. The great wealth of knowledge imbued in African arts is waning away as illegal rogue gang masters are coming from the rich countries to buy these artifacts for very down-to-earth prices and take them to museums in Europe where they are used yearly to make millions of euros. While African carvings with a wealth of knowledge are selling high in the west, no one is questioning the way they left the continent. They are moved to auction houses and museums earning between 200 and 500 times the price the legitimate owners get for their intellectual heritage. The lack of codification, unequal access and awareness of the worth of indigenous knowledge will make matters worse. This calls for both research and a clearinghouse.

Human Displacements

Africa alone is home to about 60 per cent of the world’s internally displaced persons (Cernea, 2000) and the idea is always that indigenous people are in the way of development rather than seen as important stakeholders of sustainable development as acknowledged by the United Nations in 1992. The effects of displacements are felt especially strongly amongst... indigenous communities (Chatty and Colchester, 2002). A critical review of the impacts of different human displacement cases reveals that they occur in the absence of policy standards; they are not well planned and are under-financed; they inevitably impoverish the displaced and ‘host’ populations; and are backfiring on biodiversity conservation (Schmidt-Soltau, 2005). Disappearance of indigenous populations and their knowledge raises serious human rights concerns. In Central Africa, the Korup and pigmy populations are threatened by massive relocation because

conservation projects in the region are not interested in conserving cultures and traditional knowledge. This is fast killing indigenous practices in the region.

Social Exclusion by National Governments

In the Democratic Republic of Congo, the pigmies have been totally excluded from participation in elections and public administration; they cannot even register the births of their children. Dispossessed of their lands and economy, they survive by begging and are regularly exploited by other groups. Most cannot read or write and have virtually no access to modern health care (Nyamu, 2003). With a wealth of knowledge of the genetic resources that have survived generations, they are poorer today than before. So even with their knowledge resources, they remain trapped in poverty.

Competition with Quota-bursting Foreign Commercial Loggers in the Region

Unsustainable logging by huge profit making foreign logging companies is threatening indigenous knowledge and practices in Central Africa. These greedy multinational giants selectively log species with local uses until they have become scarce and endangered in many forest areas. It encourages debarking. Of the 31 timber species exploited by a Dutch logging company, in southern Cameroon, local communities also use 19 or 86%. In a study, *Baillonella toxisperma* was cited by 60% of local people as seriously affected by logging, followed by *Guibourtia tessmannii* (bubinga), used locally for cultural and medicinal purposes, and *Entandophragma cylindricum* (sapelli), used locally for construction (Dijk, 1999). Other species directly affected by demand for a species' timber value in the region include *Terminalia superba* (fraké), *Milicia excelsa* (iroko), *Lophira alata* (azobé) and *Lovoa trichiliodes* (bibolo). Sustainable logging is not all bad. It can positively affect a suite of species that prefer disturbed forest areas and roadsides. In Central Africa, these include rattan species as well as many condiment and medicinal species. In southern Cameroon, logging appeared to cause abundant regeneration of the condiment species *Ricinodendron heudelotti*, and to have limited impact on the size and class distribution of *Irvingia gabonensis* (Dijk, 1999).

Biopiracy: Intellectual Property Rights Regimes

IKS have been patented and westerners owning copyrights merely repackage the knowledge base from local Africans (Eyong et al., 2004). A good example is a multiple-use tree species *Prunus africana* that has local as well as international economic and medicinal values. The bark is the major source of an extract used to treat benign prostatic hyperplasia, an increasing health problems in the area. This tree is found in Angola, Burundi, Cameroon, DR Congo, Equatorial Guinea, Rwanda, Sudan and Uganda. Its bark which contains phytosterols or beta-sitosterol, pentacyclic triterpenoids like ursolic and oleaic acids and ferulic esters of docosanol and tetra-cosanol, is exported to Europe for drug production. The yearly harvest amounts to 3,500 tons and it is valued at US \$63 per kg of bark. The price paid to bark harvesters is 180 times less than the market value of US \$63 per kilo in Cameroon where licensed harvesters were paid about US \$0.35 per kilo in the 1990s (Laird, 1999). Despite these low prices and trade bans, there were reports of illegal and complete stripping or felling of trees in Cameroon and Uganda under the watchful eyes of agents of the French Groupe Fourmier.

Indigenous Bakwerians in Cameroon reported to colonialists that they had used the bark of pygeum to treat "old man's disease" or benign prostatic hypertrophy for centuries. Despite its African origin and indigenous base, a French entrepreneur, Dr. Jacques Debat, in 1966 lodged the first patent for pygeum bark extract transforming its local use as medicine and other purposes to an international commodity for the pharmaceutical industry for the treatment of prostate disorders. Drugs from prunus have an estimated over-the-counter value of US \$ 220 million per year. The timber is hard and durable. A complex chain of stakeholders is characteristic of its exploitation and sale. For instance, locals with tree tenure rights, harvesters, transporters, middlemen, processors, exporters, governments, and pharmaceutical companies like the French company, Groupe Fourmier, with the brand name "Tadenan", Italian Inverni della Beffa and Indena Spa use the brand name "Pigenil". In 1990, the University of Toledo applied for a U.S. patent on the use of Endod to control zebra mussels, claiming a share of 50% of the royalties with the inventors. This United States patent masks the true ownership and discoverers of this indigenous

African plant. Such a legal claim denies centuries of selecting and cultivating Endod by indigenous Africans and its multiple uses.

An effect of these challenges is the worrying idea of loss of native cultures, loss of indigenous languages and knowledge that may lead to further environmental degradation. Since indigenous ecological knowledge of managing the environment is embodied in languages, its extinction is pretty easy as it is passed on to other groups or new generations orally. The mass media have even posed a great threat as families spend time watching pop music and soap operas on television, than tell folk tales, sing folk songs, and so on (Eyong et al., 2004) that are powerful vehicles for transmitting indigenous knowledge. About 600 languages have been lost in one century and 90 percent might be lost in this century, the majority of which are spoken by indigenous peoples (Melchias, 2001). Expanding markets, global communications and globalization promote dominant languages at the expense of native ones. Today, French, English and Spanish are replacing native languages. Such a loss is not without repercussions, especially on sectors like biodiversity conservation.

Currently, Africans and their donor partners are wastefully paying for these avoidable distortions with little achievement. It was thanks to the Convention on Biological Diversity that traditional knowledge became recognised at least on paper. It recommended inter-state cooperation for the development and use of indigenous and traditional technologies and the wider application of local knowledge, innovations and practices (United Nations, 1992). Despite this recognition, the convention failed to state how access to and use of traditional knowledge and resources could be protected to minimize negative impacts on local communities and ecosystems. It also advocated commensurate compensation to local communities for their contributions in ethno-medicine, plant breeding and other forms of knowledge but failed to set limits. However, it remains a source of healing of therapeutic importance in the context of unhealthy imbalances, distortion, trivialization and neglect inflicted by euro-centric education and governance on African IKS.

It is fair to state that incessant failures in development projects in Africa also spurred populist development theorists to revisit Chambers' (1996) concept of whose reality counts. Consequently, indigenous knowledge is to be

celebrated, used and acknowledged in development projects rather than denigrated (Crewe & Harrison, 1998). Indigenous knowledge made it ethically imperative that developers be more receptive to the technology, skills and accumulated knowledge of the people they worked with. In agricultural research, this challenge resulted in the rapid shift from viewing peasant farmers as 'backward' to viewing them as 'rational', even 'super-rational', and possessing the key to achieving sustainable agriculture. There is growing awareness of indigenous knowledge in addressing health and environmental issues. The worrying thing is when it comes to sharing benefits, indigenous peoples are yet to gain from these extensive contributions.

THE WAY FORWARD

A comprehensive proactive policy framework is the best way to conserve indigenous knowledge that has helped produce, use and maintain diversity in the region. A strong sustainability connection exists between indigenous and modern knowledge. Time-tested ancient wisdoms combined with modern technologies can create solid foundations for sustainable development in Central Africa if the measures discussed in the next sub-sections are effectively implemented.

Revitalisation of Indigenous Coping Mechanisms

The first step towards revitalising indigenous coping mechanisms in Central Africa involves the genuine commitment of local, national, regional and international initiatives to an objective scientific enquiry by an interdisciplinary team. The overarching goal should be to systematically document IKS with an active involvement of indigenous peoples. Though very much contested, oral tradition remains the best tool for recollecting past memories, genealogies and indigenous practices. However, researchers must be fully sensitive to the status of the provider of information, with respect to idiosyncrasies, repertorial effects, knowledgibility and the various versions of explanations given. First, indigenous leaders should be questioned on their identity and how this information is shared in their community to have a clear understanding of whether orally transmitted information is myth, legend, proverb, chant, praise song or of unidentified or unidentifiable origin. From

these baseline data, one can determine whether it is sufficient for researching genealogy, traditions of origin, migration patterns, settlement patterns, biography, spiritual and religious trends, medical techniques, food processing, textile, building, botanical or other methodologies, general lifestyle and so on. The use of local translators has been hailed but triangularity through incessant probes should help to reduce distortions on any grounds by translators. Collected data should be carefully documented, preliminary findings shared with local communities through interactive workshops and seminars. The final outcome of research on collective memories should be taught in basic, secondary and tertiary institutions of learning as well as specialized training schools to ensure continuity.

Fighting Poverty through Promoting Sustainable Livelihoods

A committed fight against poverty will entail taking the fight to the poverty stricken victims without conceptually separating rural livelihoods and rural life. Consequently, the promotion of sustainable livelihoods through the use of indigenous coping mechanisms must include appropriate place-based political organisation principles of community governance. This entails empowering paramount chiefs, community heads, queen mothers and village councils. Indigenous warning systems should be carefully combined with scientific ones to produce credible warning systems better understood and controlled by indigenous people who need them for disaster management. To bridge the knowledge divide the continuum between IKS and the global processes of knowledge sharing through timely and efficient mobilisation, coordination, and collaboration by all stakeholders is required. Inter and intra village communication technologies to enhance existing inter-community communication and ensuring their appropriate use by all is needed.

A Comprehensive and Adaptive Information Communication Technologies (ICT) Policy

The world is so networked that Central Africa cannot escape from ICTs and the fast expanding capitalist market and a wait-and-see policy will be disastrous. Crosscutting policies are needed to ensure equitable access to the right kind and format of information, for poor people to ensure that existing inequalities are not exacerbated. There is

need to promote local content through information sharing between local institutions that bring in new information from outside and encourage electronic citizenship. Existing policies and systems should be strengthened and new systems should seek to build on existing systems, while capacity building at all levels to equip people with new skills to develop and manage new systems are needed. Use of realistic technologies that enhance and add value to existing systems and the desire to build knowledge partnerships that cross national, ethnic and social boundaries have much in promise. Hence, committed attempts to bridge the digital divide will hardly eradicate unequal conditions of information exchange, if countries in the region do not undertake parallel efforts to join the cyberspace as generators of ideas, rather than as mere recipients. By harnessing the Internet, large-scale dissemination of ideas, mobilisation of resources and collaboration among communities, networks, organisations and international partners can be facilitated. Full integration will ensure mutually beneficial commerce, enhance education and adequate cultural development otherwise ICTs will continue to encourage dependence, promote cultural imperialism and neo-colonialism and thereby further deteriorate the position of these states in the global network. Committed support without ulterior motives from developed countries is a precondition for proactive solutions rather than empty talk and promises.

Incorporation of Indigenous Healers in Modern Healthcare Facilities

There is cry for the need to integrate indigenous medical practitioners into the state healthcare delivery systems. This is important because it fosters information exchange, networking and partnerships for sustainability at local, regional and international levels. In the 1980s, indigenous healers were integrated in hospital units but suddenly the issue of equality in status with modern healthcare practitioners became a big problem. The arguments on both sides were substantive given the fact that indigenous healers were very effective in treating diseases like fractures, insanity, psychological worries, snake bites, sterility and many others that took pretty long for their counterparts to treat with modern medicines. To some, indigenous healers saved more lives than their western oriented counterparts. Today, the registered

association of traditional healers is a platform for witch-hunting and is forcing many healers to fall over backwards. Quacks have now rushed into cities and are abusing the natural gift of healing and sooth saying to make money. To overcome all these, collaboration and a constant information flow between indigenous healers and modern medical practitioners should be enhanced because it is largely for the benefit of the poor and unhealthy. Indigenous healers need some training on standardization for safety and quality. While these are not the magic bullets, local, community and national level research is needed for governments to make informed decisions.

IKS are important for treatment of diseases such as HIV/AIDS, malaria and others in Central Africa. Hence, in-situ and ex-situ conservation of medicinal plants to deal with such national emergencies should be encouraged and indigenous people should be allocated to drive these efforts. While relocation with alternative income generating activities is one way to go about conserving biological diversity in the region, this paper argues that a participatory and an informed give-and-take process is sensible and practical. Noteworthy is the fact that settlement in and migration out of traditional habitats affect the acquisition of ethnobotanic knowledge. Hence, community-based medicinal plant conservation and cultivation programmes that recognise women as important herbal practitioners that need appropriate and committed support should be encouraged. Agreeably, this might be an uphill task that is not impossible. Indigenous communities should be on the driving seat of such programmes because this is the best way to ensure participation. Indigenous people should have a vital role in environmental management and development because of their knowledge and practices while states recognize and duly support their identity, culture and interest, and enable their effective participation in sustainable development. The Convention on Biodiversity recognizes that the rich North has biotechnology and the poor South has a rich gene pool. Hence, the industrialized world must accept that biodiversity is needed to make biotechnology meaningful and vice versa. The benefits of their complementing outcomes should be commensurately shared. Green labelling should be enforced to control destructive felling and smuggling of plant species with medicinal value.

Need for a Clearinghouse

Indigenous knowledge has enormous economic, health and social endowments. Farmers have often selected plants for higher productivity and better quality but when companies do them today, they call it 'improved varieties'. But ethnobotanists from the North collect plant species with horticultural potential and plants useful to develop pharmaceuticals, cosmetics, household or industrial products and seeds from crop plants. Also, seeds collected from the region are stored in seed banks in the North under patents with no compensation for the generation of experiences of indigenous breeders. For the intellectual property rights regime to be an effective measure to counter these losses and bring hope to Central Africans, a clearing-house must be established in the region. That is a body that coordinates the partnerships agreements between states. This body will check the activities of screw-driver collectors who can relocate to another country that does not exert much control over its genetic resources. With a strong legal base, this body will ensure an adequate sharing of the benefits so that knowledge givers can also benefit.

Socioeconomic Valuation of Indigenous Knowledge

Valuation means acknowledging IKS' function and utility. They have socio-cultural values (cultural perceptions, equity), ecological values (ecological sustainability), usually measured and monitored with the use of indicators of their contribution to ecosystem integrity and resilience and regenerative capacities. Economic values are driven by willingness to pay and willingness to accept the contributions of IKS to modern scientific discoveries and salvation of large scale epidemics. These could be measured using valuation techniques like; hedonic pricing, contingent valuation and travel cost methods. Getting the price right will be a perfect balance between what people pay for and what they get. There is need for multi criteria analyses of IKS to fix their total economic value (TEV) that includes: use values, option values (pay to secure a potential future use) and non-use values (passive use or existence value). This valuation should raise the compensation scheme from 0.001 to say 5 percent of the \$43 billion annual global profits from medicinal plants. This will mean \$2.15 billion

going to help fight poverty in indigenous communities. This is money they deserve that has been coming as aid (loans) but not after begging by governments. All pharmaceutical companies should make this a priority to increase payments for indigenous contributions as part of their corporate social responsibilities. Such a valuation shall form the basis on which the clearinghouse shall function.

Countering the Dependency Effects of Globalisation

The best way to reduce dependencies on outside states by states in Central Africa is conserving the knowledge base of their indigenous groups and to encourage Indigenous Peoples Management because they encourage indigenous peoples to sustainably maintain, manage and use their natural resources, while strengthening indigenous ecological knowledge. This safeguards indigenous peoples' human and development rights on the crossroads of globalization and expanding economic and market forces, while preserving cultural diversity. Overexploitation of wild plant resources will also reduce if countries in the area create sustainable markets. That is, we should put effective controls to eliminate the role of illegal brokers or middlemen because the low prices paid to indigenous people for harvested non-wood forest products opens the way for increased harvest in the hope of gaining a substantial amount of money to meet the ever increasing needs. The driving engine for this will be a cautious thought process on the fact that globalisation impacts knowledge flow, political dynamics, and property rights, raising questions about how increasingly marginalised communities can balance their needs and knowledge with the obligation to conserve diminishing resources. However, the idea that prevention is better than cure should spur governments in the region to redirect support to indigenous communities to cement the partnerships between them and researchers.

Documentation of indigenous knowledge is also possible and currently, the International Centre for Living Aquatic Resources Management (ICLARM) in the Philippines, in partnership with the Food and Agricultural Organisation (FAO), is assembling a comprehensive database of the 24 000 species of cartilaginous and bony fishes in the world, tapping traditional knowledge to

conserve and utilise fish genetic resources. In addition to scientific and technical information, the database incorporates indigenous knowledge; common names, traditional management practices and practical or symbolic uses of each species (Melchias, 2001). This shows that indigenous knowledge has an intrinsic link with modern science. The process of discovery is always intuitive, accidental, conjectural or inspirational. With holistic socio-cultural and spiritual dimensions, the transfer and sharing of indigenous knowledge is often collective rather than individualistic, which is good for sustainable development. In themselves, markets will not push indigenous knowledge to grow since it is not for profit nor is it prone to mass production and economies of scale. Countries in the region should not sit and wait for foreigners to come again to collect and document their treasures because little or no financial benefits will come to knowledge providers. Regional bodies should document and sell data to researchers from rich countries. The initial costs for setting up such bodies may be frightening but unavoidable if sustainable development of indigenous peoples is an overarching goal.

Ethnobotany should be made a critical and compulsory subject in primary, secondary and university institutions in the region and taught with innovative tools for teaching sustainability. Such pedagogic tools must illustrate interrelationships, be interactive, clear, illustrative, understandable and user friendly. The curriculum should focus on the cultural uses of plants, group perception, classification and naming of plants to avoid biological extinction. Focus on the dichotomy between nature and culture provides a unique view for accessing information important for conservation (Carlson and Maffi, 2004). The teaching and learning of ethnobotany and conservation of bio and cultural diversity should be aimed at imparting the t-shaped skills. That is, conservators should be knowledgeable in multi, trans-and inter-disciplinary issues as well as being experts in their domains.

CONCLUSION

IKS of Central Africa have a potential for ensuring its sustainable development. This paper presents indigenous practices that are rapidly being abandoned by the elite in the region. While these systems are treated as having a high

sustainability potential in the region, this paper falls short of advocating a complete return to the traditional (old times) values but rather questions why they have to be abandoned in preference for supposedly modern but unsustainable and alien values when they could have been revived and adapted to changing realities. It is true that indigenous knowledge is discriminately transmitted from one generation to the next as is the case of the secrets surrounding the rite of initiation and the spirit of the forest that are deemed inviolable by the Pygmies. Males, who are the only holders of initiation knowledge, are very evasive and mysterious when they are asked about this subject, which can make any codification process an uphill task. However, seasoned anthropologists leading interdisciplinary teams would do the job to systematically document IKS in Central Africa so that their owners can benefit more than they do today for such treasures. To make bio-prospecting a win-win situation for both pharmaceutical companies and the true owners of knowledge of medicinal plants, socioeconomic valuation of indigenous knowledge is urgently needed. A somewhat acceptable 5 percent value of annual profits from medicinal plants should go to indigenous peoples in the area for their knowledge contribution. Revitalization helps local authorities, development cooperation policy-makers, natural resources managers, and stakeholders in their epic attempt to ensure food security and fight against poverty which is a reality in the region. Revitalisation means social re-engineering to make traditional institutions of governance participatory, revolving on community-based knowledge management schemes with more equitable access to and control over knowledge production, sharing and application. NGOs, which have been effective instruments of people's participation, facilitators and catalysts in development, must start by learning from what local people already know.

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KEYWORDS Awareness; bio-prospecting; Central Africa; clearing house; indigenous knowledge; indigenous management; revitalisation of indigenous coping strategies and sustainable development

ABSTRACT In today’s world, knowledge is a factor of production fuelling the knowledge economy characterised by patents, research and development. This presupposes that owners and providers of knowledge be adequately endowed for their treasure. The Central African region represents just one example of how existing property rights regimes have denigrated the value of indigenous wealth, largely due to lack of codification, documentation and adequate legal cover. Western pharmaceutical companies are sucking dry this knowledge for commercial exploitation through the use of patent rights without paying commensurate royalties to the true owners and discoverers of knowledge and invention in the region. This case study provides examples of indigenous knowledge systems that are being eroded due to internal and extraneous factors but which could be revitalised to ensure a proactive generation of the needed finance for sustainable development of Central Africa.

Author’s Address: Charles Takoyoh Eyong, Center for Development Research (ZEF a) Walter-Flex Straße 3, 53113 Bonn, Germany

Telephone: +49 228 73 4962 (Office), +49 228 3067309 (Home), *Mobile:* +49 176 2395 3469

E-mail: eyongc@uni-bonn.de

While there are prospects in interfacing African Indigenous Knowledge with other knowledge systems, a generic application of foreign ways of knowing and knowledge production “including technology systems in African cultural conditions” is inappropriate. Knowledge systems should build on locally available resources, primarily the cultural and environmental experiences of the local people for relevance and sustainability. This has implications for African educational systems and sustainable community development Case Studies in Immunology. The Molecules of Life. Living in a Microbial World.Â Introduction: Indigenous Discourses on Knowledge and Development in Africa Edward Shizha and Ali A. Abdi Section I: Indigenous Knowledge and Development 1. Reflections on “African Development”: Situating Indigeneity and Indigenous Knowledges George J. Sefa Dei [Nana Sefa Atweneboah I] 2. Intersections Between Indigenous Knowledge and Economic Development in Africa Gloria T. Emeagwali 3. Indigenization and Sustainable Development for Zimbabwe: A Post-Colonial Philosophical.