

Using traditional knowledge to cope with climate change in rural Ghana

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A survey of rural communities in the Offin river basin suggests the value of blending traditional and scientific knowledge in strategies for coping with climate change and variability.

After the December 2004 tsunami off the coast of Indonesia, calls multiplied for high-technology solutions (installation of early warning systems using cutting-edge satellite and ocean buoy technologies) to prevent similar disastrous occurrences. Meanwhile news began to circulate about how indigenous communities had escaped the tsunami's wrath by using their traditional knowledge (Box below), drawing attention to the importance of this form of knowledge to natural disaster preparedness and response.

Traditional knowledge – the wisdom, knowledge and practices of indigenous people gained over time through experience and orally passed on from generation to generation – has over the years played a significant part in solving problems, including problems related to climate change and variability. Indigenous people that live close to natural resources often observe the activities around them and are the first to identify

and adapt to any changes. The appearance of certain birds, mating of certain animals and flowering of certain plants are all important signals of changes in time and seasons that are well understood in traditional knowledge systems. Indigenous people have used biodiversity as a buffer against variation, change and catastrophe; in the face of plague, if one crop fails, another will survive (Salick and Byg, 2007). In coping with risk due to excessive or low rainfall, drought and crop failure, some traditional people grow many different crops and varieties with different susceptibility to drought and floods and supplement these by hunting, fishing and gathering wild food plants. The diversity of crops and food resources is often matched by a similar diversity in location of fields, as a safety measure to ensure that in the face of extreme weather some fields will survive to produce harvestable crops.

Adaptation to climate change includes all adjustments in behaviour or economic

Indigenous knowledge saves lives

Just before the Indian Ocean tsunami struck in 2004, numerous people were attracted to the shoreline by the unusual spectacle of fish flopping on the sea floor exposed by the sea's withdrawal. Not the Moken and Urok Lawai peoples of Thailand's coasts and islands, the Ong of India's Andaman Islands and the Simeulue community of Indonesia; they all knew to head rapidly inland to avoid the destructive force of the sea. The small villages of the Moken and Ong were completely destroyed, but their inhabitants escaped unscathed. Even more striking was the displacement of more than 80 000 Simeulue people beyond the reach of the tsunami; only seven people died. This surprisingly efficient response, striking in its contrast with the frightening losses suffered elsewhere in Indonesia, was acknowledged by the granting of a United Nations Sasakawa Award for Disaster Reduction to the Simeulue people.

Source: Elias, Rungmanee and Cruz, 2005.

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The River Offin is the main source of water for the communities in the river basin

structure that reduce the vulnerability of society to changes in the climate system (Smith, Ragland and Pitts, 1996). Whether people can adapt, and for how long, depends on the resources available. Africa is the region most vulnerable to the negative impacts of climate change and at the same time has low adaptive capacity. But the people, particularly at the local level, are making efforts to adjust to the changes they observe.

Warming through the twentieth century in Africa has been estimated at between 0.26 and 0.5°C per decade (Hulme *et al.*, 2001; Malhi and Wright, 2004). This trend is expected to continue and even to increase significantly, with attendant negative effects on livelihoods. According to the Intergovernmental Panel on Climate Change (IPCC, 2007), a medium-high emission scenario would see an increase in annual mean surface air temperatures of between 3° and 4°C by 2080. This implies difficult times ahead for local people that depend directly on natural resources for their livelihoods and have few assets or technologies to cope with the changes to come.

In Ghana, recorded temperatures rose about 1°C over the last 40 years of the twentieth century, while rainfall and runoff decreased by approximately 20 and 30 percent, respectively (Ghana Environmental Protection Agency, 2000). As

a country that depends mainly on rainfed agriculture, Ghana is extremely vulnerable to climate variability and change. But over the years, farmers and other natural resource dependent communities in the country have found varied ways of coping with these changes, based on traditional knowledge and practices.

This article assesses strategies by rural communities in the basin of the River Offin in Ghana to cope with climate change and variability. Their views on climate change and accounts of their means of coping with the changes were collected in 2007 through semi-structured questionnaires, focus group discussions, interviews and field observations in 20 rural communities. Only community members 40 years and above were questioned, on the assumption that younger people would have less experience of climate changes and fewer relevant observations. At most ten questionnaires were administered per community.

Through the focus group discussions and questionnaires, individuals who showed appreciable knowledge of environmental changes around them were selected for in-depth interviews. They were mainly experienced local farmers who could attest to noticeable changes in rainfall and temperature, and traditional elders and leaders who were involved in community decision-making.

THE CONTEXT OF THE OFFIN RIVER BASIN

The Offin river basin has a semi-humid tropical climate and moist semi-deciduous forests. The communities covered in the study are rural and predominantly subsistence farmers. Some are also involved in cocoa farming. Agriculture in this region, as in most parts of Ghana, is rain dependent and the planting seasons parallel the two rainy seasons – the main season from April to July and the minor season from September to October. Livestock rearing is limited. Economic activity is low, although most of the people engage in small-scale trade to augment their low income from agriculture. About 90 percent of the communities covered have no running water and depend on the rivers, streams and rainfall for their water needs.

OBSERVED EFFECTS OF CLIMATE CHANGE IN THE OFFIN BASIN

The indigenous people in the study area may not understand the concept of global warming or climate change, but they observe and feel the effects of decreasing rainfall, increasing air temperature, increasing sunshine intensity and seasonal changes in rainfall patterns. Their observations are corroborated by a study that recorded a reduction in mean annual rainfall of 22.2 percent and a gradual rise in average maximum temperatures of 1.3°C or 4.3 percent from the 1961 to 2006 (Gyampoh *et al.*, 2007).

Partly as a result of reduced rainfall – compounded by deforestation and forest degradation – discharges in all the water bodies in the basin have been low, and some streams have completely dried up (Gyampoh, Idinoba and Amisah, 2008). Flows in the River Offin have decreased from 6.9 m³ per second in 1957 to 3.8 m³ per second in 2006 – a 45 percent reduction (Gyampoh *et al.*, 2007). In the dry seasons of 2006 the flow was so low that the river bed was exposed, and some of the wells dug by communities to ensure availability of water year round also



The River Offin dries up to the river bed during the peak of the dry season, making water scarce

dried up, indicating a possible reduction in groundwater. Water availability is decreasing at a time when the communities' water demand is increasing because of population growth.

Recent crop failures in the basin, especially since 2000, have been attributed to low rainfall, prolonged rainfall shortages and changes in rainfall patterns. Agriculture in the basin is rainfed and farmers have over the years developed ways of predicting the arrival of the rainy season. Farmlands are cleared and prepared in anticipation of the rains to start the cropping season. However, during recent years the beginning of the rainy season has become unpredictable. In some years, the first rains have arrived at the normal time but have been followed by an unexpected long break before resuming. Thus it has become difficult for farmers to plan their cropping seasons to coincide with the rains to ensure maximum crop yield. In addition to the problem of timing, prolonged rainfall shortage has caused drought situations, with reduced water available in the soil for crop growth. The result has been low crop yields or crop failure.

Increasing temperature and intense sunshine, coupled with prolonged rainfall shortages, cause crops to wilt. Some cocoa growers described their trees withering as a result of exposure to intense and prolonged sunshine. Vegetable

growers claimed that high temperatures were causing their vegetables to ripen prematurely, decreasing the sale value of their produce.

When crops fail, money spent on land preparation and planting, as well as income from the sale of farm produce, is lost and household savings are spent to replant. People can withstand occasional bad harvests but have trouble coping with consistently bad ones.

Heat and water related diseases are becoming more common in the basin. Malaria incidence has increased, as people are exposed to mosquitoes by sleeping in the open or with their windows open because of unusually high night temperatures. During prolonged rainfall shortages, water sources become scarce, stagnant and contaminated, raising the incidence of diarrhoea and bilharzias. Shingles and other skin conditions, some of which were previously rare in the communities, have also become common during periods of high temperatures, according to those interviewed.

TRADITIONAL COPING STRATEGIES – AND CHALLENGES

The study revealed a variety of coping strategies applied with mixed success, which suggests that local traditional knowledge could provide the basis for development of more effective strategies.

The people in the surveyed communities realize that water shortages are a major threat to their survival and have developed several strategies to adapt to this phenomenon. One is to reuse water, for example from washing clothes or utensils, to irrigate backyard gardens and nurseries. Households are also rationing water, trying to reduce the water use per person per day. However the practice is abandoned as soon as the rains begin. This strategy needs to be part of a behavioural change and not applied only during periods of water shortage.

Most communities are actively reviving rainwater harvesting, a traditional way of collecting and storing rainwater in big barrels placed under the roofs of houses. This practice had largely been abandoned when the communities installed wells and boreholes, but has attracted interest again as a result of their drying up. However most of the communities covered in the study reported that they are unable to harvest enough rainfall under the current climate.

The traditional and local authorities identified clearing of riparian vegetation as a major factor increasing soil erosion and siltation of rivers, which eventually reduces stream flow, and they are adopting measures to remedy the situation. The measures include creating awareness of the effects of deforestation around

Intense sunshine withers cocoa leaves in the absence of shade from trees





Barrels for collecting rainwater from the roofs of buildings are common in rural households

water bodies, sensitizing the communities about prevention of bush fires, promoting community-based management of forests and imposing fines on those who indiscriminately set fire to the forests, clear riparian vegetation or violate other measures to protect the environment. However, these efforts by the traditional authorities are not yielding notable results because the communities, although still rural in terms of development and infrastructure, have become more cosmopolitan or heterogeneous and no longer adhere as absolutely to traditional authority as they did in the past. The communal nature of the communities is breaking down; people now tend to be more concerned with individual than with collective well-being.

Traditional taboos, such as forbidden days when nobody was supposed to go to the river so the river spirit or god could have a day of rest, once also provided a means of protecting the water bodies. However, the observance of such taboos has declined with modernization and the increasing heterogeneity of the communities. With the widespread adoption of Christianity, traditional spiritual practices are now seen as superstition. Religion is a delicate issue in these communities, and some of the traditional

laws, although potentially useful, are not completely adhered to.

As described above, indigenous knowledge in agriculture and water management, acquired over many years of practice, previously helped the communities to cope well with water shortage, droughts and crop damage or losses, but traditional approaches have become difficult to apply in recent years because of changing rainfall patterns. Farmers are adapting to this constraint by planting different crops. Crops that thrive well under the current prevailing conditions are increasingly being planted in areas that previously did not support their cultivation. An example is the shift from cocoa cultivation to drought-resistant crops such as cassava. Vegetable growers are also gradually moving into the river

plains where their crops can get more water. These are forms of adaptation but are obviously not sustainable. Cocoa crops, for example, were previously a major source of income for the upkeep of the farmers' families, for the purchase of agricultural inputs and for expansion of their farms. The clearing of riparian vegetation and the use of agricultural chemicals close to the rivers and streams create hazards for the environment and ultimately for the people of the region.

Most farmers recognized the importance of having trees on their farms to shade their crops from intense sunshine. However growing trees had little appeal to them because they had had negative experiences with timber companies (see Box below) and illegal chainsaw loggers trampling their crops. Sustained

Adapting to climate change by planting trees on farms: dispelling a disincentive

Until 2002, all timber trees in Ghana were owned by the government in trust for the people, and the government could give any area of land in concession to a timber company. Farm crops were sometimes destroyed by timber merchants claiming to have permits to harvest trees in concessions that covered farmlands. To protect their crops, some farmers deliberately killed the trees on their farms; tree planting held little appeal for them.

The Timber Resource Management Amendment Act of 2002 provides that the right to harvest trees and extract timber from a specified area of land shall not be granted if there are farms on the land, unless the consent of the owners of the farms has been obtained, or if timber is already being grown on the land under the ownership of any individual or group of individuals. However this legislation has not significantly changed the relationship between timber merchants and farmers, because most farmers are unable to show clear proof of ownership of trees on their farms (i.e. proof that they either planted the trees or tended

them until maturity). Farmers also tend to be uninformed about forest laws and lack the financial strength of timber merchants. However, as a result of efforts by some non-governmental organizations to educate farmers about the forest laws and to help them obtain proper documentation of the ownership of planted trees, some farmers are now beginning to incorporate trees in their farmlands or to protect existing trees.

Because of previous poor legislation and lack of awareness of their current rights, farmers have sometimes killed trees on their farms (by ringing them, for example) to keep timber firms away



awareness programmes are needed to inform rural farmers of their rights and to empower them to protect their farms and most importantly to plant more trees.

THE WAY FORWARD

The partial success of the use of traditional knowledge in coping with climate change leads to the conclusion that a healthy relationship between scientific knowledge and traditional or indigenous knowledge – which both have their limitations – is desirable, especially in developing countries where technology for prediction and modelling is least developed. Whereas most precipitation models and records mainly focus on changing amounts of precipitation, indigenous people also emphasize changes in the regularity, length, intensity and timing of precipitation. Whether or not scientific models are incorporated into local explanations depends on the status and accessibility of science within a culture and on the influence of the communications media (Salick and Byg, 2007).

To capitalize on, develop, expand and mainstream indigenous adaptation measures into global adaptation strategies, traditional knowledge should be further studied, supported and integrated into scientific research. Incorporating indigenous knowledge is less expensive than bringing in aid for populations unprepared for catastrophes and disasters, or than importing adaptive measures which are usually introduced in a top-down manner and difficult to implement, particularly because of financial and institutional constraints.

There is much to learn from indigenous, traditional and community-based approaches to natural disaster preparedness. Indigenous people have been confronted with changing environments for millennia and have developed a wide array of coping strategies, and their traditional knowledge and practices provide an important basis for facing the even greater challenges of climate change. Although their strategies may not suc-

ceed completely, they are effective to some extent and that is why the people continue to use them. While indigenous communities will undoubtedly need much support to adapt to climate change, they also have expertise to offer on coping through traditional time-tested mechanisms. ♦



Bibliography

- Elias, D., Rungmanee, S. & Cruz, I.** 2005. The knowledge that saved the sea gypsies. *A World of Science*, 3(2): 20–23.
- Ghana Environmental Protection Agency.** 2000. Ghana's initial national communication under the United Nations Framework Convention on Climate Change. Accra, Ghana.
- Gyampoh, B.A., Idinoba, M. & Amisah, S.** 2008. Water scarcity under a changing climate in Ghana: options for livelihoods adaptation. *Development*, 51: 415–417.
- Gyampoh, B.A., Idinoba, M., Nkem, J. & Amisah, S.** 2007. Adapting watersheds to climate change and variability in West Africa – the case of Offin River basin in Ghana. In *Proceedings, Third International Conference on Climate and Water*, pp. 205–213. Helsinki, Finland, Finnish Environment Institute (SYKE).
- Hulme, M., Doherty, R.M., Ngara, T., New, M.G. & Lister, D.** 2001. African climate change: 1900–2100. *Climate Research*, 17: 145–168.
- Intergovernmental Panel on Climate Change (IPCC).** 2007. *Climate change 2007: the physical science basis*, ed. S. Solomon, D. Qin, M. Manning, M. Marquis, K. Averyt, M.B. Tignor, H.L. Miller Jr. & Z. Chen. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK & New York, USA, Cambridge University Press.
- Malhi, Y. & Wright, J.** 2004. Spatial patterns and recent trends in the climate of tropical rainforest regions. *Philosophical Transactions of the Royal Society Series B*, 359: 311–329.
- Salick, B. & Byg, A., eds.** 2007. *Indigenous peoples and climate change*. Oxford, UK, Tyndall Centre for Climate Change Research.
- Smith, J.B., Ragland, S.E. & Pitts, G.J.** 1996. A process for evaluating anticipatory adaptation measures for climate change. *Water, Air and Soil Pollution*, 92: 229–238. ♦