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Climate change adaptation: Linking indigenous knowledge with western science for effective adaptation

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ABSTRACT

The implementation of climate change response programmes for adaptation and resilience is anchored on western scientific knowledge. However, this has led to a tendency to marginalise indigenous knowledge as it is considered unimportant in this process (Belfer et al., 2017; Lesperance, 2017; Whitfield et al., 2015). Yet, knowledge systems rarely develop in isolation as they normally tend to cross-fertilize and benefit from each other. In this regard, we think that indigenous knowledge is just as important as scientific knowledge and the two must be integrated through multiple evidence base approach for climate change adaptation and mitigation. In this paper, focussing on African traditional society, we combine oral history with the available literature to examine traditional knowledge and awareness of climate change and related environmental risks. Interesting themes emerge from the knowledge holders themselves and our analysis uncovers a wide range of adaptive coping strategies applied with mixed success. From spotting and reading the position and shape of the 'new moon' to the interpretative correctness of its symbolism in "applied traditional climatology," and from rain-making rituals to conservation of wetlands and forests. Generally, findings seem to suggest that traditional African knowledge of environmental change may be as old as the society itself, with local knowledge transmitted from one generation to the next. Based on the perceived vulnerability of indigenous communities, many scholars tend to argue *generically* for the integration of indigenous knowledge into climate change policies and implementation (Ross, 2009; Maldonado et al., 2016; Etchart, 2017). In this paper however, we attempt to supplement these arguments by providing *specific and contextualised* evidence of indigenous knowledge linked to climate change adaptation. It is demonstrated that indigenous knowledge is neither singular nor universal, but rather, a voluminous, diverse and highly localised source of wisdom. We conclude that integration of such unique and *specific* indigenous knowledge systems into other evidence bases of knowledge, could be one of the best ways to the more effective and sustainable implementation of climate change adaptation strategies among target indigenous communities.

1. Introduction

Climate change is probably the most unprecedented global environmental challenge of our time. Its impacts are felt across all sectors and sections of society. Of these, the most directly affected is probably rain-fed agriculture (Culas, 2012; Sheffield et al., 2014); and because of this, indigenous communities dependent on agricultural livelihoods are likely to be the most affected. However, although indigenous people are already widely acknowledged as the most vulnerable to the impacts of climate change (Culas, 2012; Whitfield, 2015; UNFAO, 2011; Thomas and Twyman, 2005), their unique knowledge and experience remain largely under-utilised by interventions that aim to reduce vulnerability or increase adaption to new circumstances. For example, the IPCC Working Groups (WGs) do realise the importance of indigenous knowledge and make attempts to include this knowledge. In the most recent reports (AR4, and AR5) engagement is however sometimes ignored or often limited in scope (e.g., in the physical science assessment by WGI; impacts, adaptation and vulnerability by WGII; and mitigation by WGIII). Yet the measures covered are designed for the most vulnerable, and indigenous communities in particular (Ford et al., 2016; Belfer et al., 2017) where local knowledge holders and expertise could be highly valuable. There are varied reasons for this negligence and omission, but many have been explained using lenses of critical political ecologies and discursive spaces (Robbins, 2012; Death, 2014; Mcdonell,

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2016; Belfer et al., 2017). Scholars have however demonstrated that there is much to learn from indigenous and community-based approaches to climate change adaptation, resilience and disaster preparedness (Thornton and Manasfi, 2010; Berkes, 2012). Borne out of their long-term experience and experimentation, indigenous people have often adapted to environmental change through techniques and approaches using knowledge transmitted both orally and in practice from one generation to the next (Salick and Byg, 2007; Mcdonell, 2016). Through this process, they have been able to develop or enhance and maintain locally or regionally, a wide array of coping strategies (Tengö et al., 2014). Arguably, their knowledge and practices can provide an important basis for today's efforts in dealing with even greater challenges of climate change (Belfer et al., 2017; Fairhead et al., 2017).

Given the arguments above, and given that the climate has always been changing, albeit usually at rates slower than those currently being experienced (IPCC, 2014b), the aim of this study was to investigate how some of the indigenous peoples of the African continent have historically been adapting. There were two specific objectives of this study, to:

i enhance understanding on indigenous peoples' coping and adaptation strategies to climate change;
ii contribute to policy debates on intervention approaches by identifying areas of indigenous knowledge that could be integrated with other forms of knowledge (e.g., scientific) and understanding so that climate change adaptation could be sustainably enhanced.

2. Methodology

As part of the ongoing investigation on rural livelihood adaptation to climate change and knowledge complementarity anchored on multiple-evidence base (MEB) concept (Tengö et al., 2014), we extract, contextualise and discuss thematic areas that emerged from some of the oldest ethnic agriculturalists and pastoralists in the sub-Saharan Africa and the Sahel. We identified these themes from focus-groups and in-depth oral interviews conducted from 2016–2018. We looked for further evidence and validated these findings using secondary sources in the form of textual content. We further attempted a discourse assemblage in the discursive spaces on some of the indigenous knowledge contents and practices on coping with changes in environmental conditions and climate.

2.1. Selection of study area

The selection of the study area was based on past research on food security in the selected districts of Zambia (Makondo et al., 2014) and the observed population dynamics (CSO, 2010; Simatele and Simatele, 2015):

- All the 73 ethnic groups (except the Tonga) migrated into Zambia from various parts of southern, eastern, western and central Africa between 17th and 18th Century (Brelsford, 1965; Ohadike and Tesfaghiorghis, 1974);
- With formal employment rates at about 20 percent of the total population of 16.4 million, about 80 percent of the population is engaged in rural and natural resource-based livelihoods. The most prominent are small-scale farming, animal raring, natural resources harvesting, hunting and fishing (CSO, 2015);
- Located in Central Africa and ranked among the most peaceful countries in Africa (IEP, 2014), Zambia continues to be a safe haven for migrants and refugees from war-ravaged and dictatorial regimes across the continent (UNHCR, 2015);
- Some of the oldest refugees and those without surviving family members in source countries have been integrated into Zambia as nationals, making Zambia one of the most diverse countries in Africa ethnically and culturally (Jacobsen, 2001).

2.2. Selection of respondents

Often, studies of indigenous knowledge have taken limited account of the diversity of expertise that may exist within this "blanket" term (Chalmers and Fabricius, 2007). We therefore aimed to explore this diversity, and the factors that lie behind it. With the help of local leaders, and relying on their "mental registers", snowball sampling was used to arrive at 100 respondents regarded as local experts of traditional or indigenous knowledge, scattered across central and southern provinces of rural Zambia. These individuals were interviewed by asking simple questions such as: "do you know how people in your ethnic group were able to survive changes in environmental conditions and climate', and/or 'do you know of anyone who knows about this'? Depending on the feedback from these questions, and on age, livelihood, migration history/ethnicity and gender, a group of 18 participants knowledgeable about how people survived changes in environmental conditions and climate was arrived at. The 18 were considered and collectively believed to hold legitimate indigenous knowledge by the local community members themselves. Their age range was believed to be between 70 and 97 years as they did not have birth certificates. These represented 16 ethnic groups, 15 sub-Saharan, 3 Sahel descendants, comprising a near gender balance of 8 women and 10 men. Our core questions to individuals of this group were four-fold:

- According to local experts, how were the indigenous people able to cope from and adapt to changes in environmental conditions and climate in the past?
- How do their adaptation strategies compare to modern-day (scientific) approaches?
- With specific examples, please share what you think was not working well with indigenous adaptation?
- What do you think has not worked well with the modern-day approach?

2.3. Themes

The responses to the above interview questions covered broad and diverse themes. However, after analysing the responses, 11 thematic areas emerged. With follow-ups, clarifications and combining literature evidence, these were narrowed down to seven thematic areas since they were related. We outline and discuss these to highlight some of the evidence gathered on the approaches, techniques and mechanisms indigenous people claim to have drawn upon for centuries in climate change adaptation efforts in sub-Sahara and the Sahel.

3. Findings

3.1. Migration, traditional agroforestry and management of degraded farmlands

Moving from one place to another and closer to resources was important. From the interview responses, the concept of "proximity" or locating near sources of resources and "maintenance of available sources" for continued sustenance occurred frequently, suggesting high value attachment to these. Proximity may have also meant moving away from diminishing sources or those that could not be maintained and locating closer to the newly identified sources. Traditional agroforestry and management of degraded farmland partly determined the migration patterns as practices developed over centuries to cope from unproductive or degraded cropland, grazing pastures and diminishing stocks of fisheries.

This was found to be consistent with the evidence in the writings by Vickery (1986) and Chevo (2014). Coping and management strategies was largely anchored on swidden agriculture which involved shifting cultivation, prune or slash, coppicing and burning (Bayala et al., 2008; Ando and Shinjo, 2017). With swidden agronomy, remnant ash