TOWARDS INDIGENOUS KNOWLEDGE INTEGRATION IN CLIMATE CHANGE: PROSPECTS FROM A MULTIPLE EVIDENCE APPROACH

FOCUS AREA

Within the climate change research community, there is now growing acknowledgement of indigenous knowledge (IK) in climate impact assessment, mitigation and adaptation. An important lesson emerging from this recognition is the need to integrate IK in mainstream climate science. However, as this agenda unfolds, the nature, level and process of integration is still shrouded in controversy. While some authorities favour a citizen science approach (e.g., Conrad & Hilchey 2011; Dickinson et al. 2012; Reyes-Garcia et al. 2020), others push for more radical emancipatory and decolonial methodologies that see IK as legitimate in its own right (Odora-Hoppers 2002; Mertens 2003; Chanza & de Wit 2013). Given the peculiarity of climate change as a field of enquiry and the complexities of IK from the diverse environments in which the knowledge is understood and applied, there is need for an approach that makes IK more acceptable on the scientific front while remaining judicious in the eyes of the holders of this knowledge. We propose the use of the multiple evidence approach (MEA) as a way to strengthen the recognition of IK in climate change science. Referred to as 'visibilist' approach (Reyes-Garcia et al. 2016; Smith et al. 2017), this paradigm argues that climate change is visible to local indigenous populations and can be tracked based on their personal experiences with climatic phenomena. Aside from guiding the meaningful participation of indigenous people in climate change research, this approach ensures that the knowledge held by people witnessing climate change can be utilised to enhance understanding of climate change from impact identification, mitigation and adaptation to the design of effective and adoptable climate change projects.

CHALLENGES

Africa is one of the regions already experiencing, and projected to experience, serious climate change impacts largely owing to underlying non-climatic drivers of vulnerability (IPCC, 2014). Among the entrenched drivers of exposure to the negative effects of climate change, is the knowledge and institutional deficiencies in giving appropriate climate information services. This problem largely emanates from data imprecision and gaps, which are often based on coarse-grained resolutions from a few isolated stations, some of which still use obsolete equipment. In some remote areas in Africa, climate infor-

mation rarely gets to the intended recipients. Ironically, most of these places not adequately covered by existing climate studies and conventional climate information services are inhabited by several groups of indigenous people who have rich knowledge about their local climates from their many years of constant interactions with the environment. These communities perceive their indigenous climate knowledge as reliable and more practical, and tend to disregard or trivialise the information they get from outsiders. On the contrary, technical personnel from government and development partners use the knowledge they acquire from formal institutions, which they regard as scientific and valid. As a result, climate change interventions driven by outsiders may face some resistance. Unless workable approaches that break this impasse are understood, the praxis of climate mitigation and adaption will remain a challenge. Apparently, methodological approaches of working with indigenous people are still being contested and some are not robust enough to ensure meaningful participation and contribution of the knowledge holders themselves.

SOLUTION

There are promising and empirical practical approaches for the use of IK in the broad field of climate change science. These include early integration in education systems and citizen science and multiple evidence approach. The former is the means towards realising the multiple evidence approach (MEA), while the latter is an example of knowledge hybridization in practice. MEA is given closer attention here:

a. IK integration in the education system. The integration should be done early enough in the education system to ensure that IK is given similar weight in informing the knowledge of climate science. Within this approach, the methods of IK enquiry that observe the sensitivity and uniqueness of this knowledge form ought to be developed and taught to ensure adequate recognition of IK. Huntington (2000) proposes that such methods could include collaborative field projects, semi-directive interviews, stakeholder networks and facilitated workshops. Chanza and de Wit (2013)

FACTS AND FIGURES

There are several empirical examples of proven knowledge hybrid areas from the co-creation of knowledge to its application in the field of climate change. These cover the broad areas of climate impact assessment studies, mitigation and adaptation (see Table 1).

discourage a hasty and ad hoc approach in indigenous science inquiry, warning that such practices would result in IK being viewed as unscientific and therefore, easily dismissed; the knowledge may remain largely partially understood, and may fail to give any practical directions to policy implementation; and generators of the knowledge could remain underrated.

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b. Citizen science. The concept is defined by Conrad and Hilchey (2011) as a process whereby citizens are involved in science as researchers. When applied to the field of climate change, citizen science suggests that local populations experiencing and observing climatic phenomena should collaborate with climate scientists to study impacts of climate change and design response strategies and projects that are appropriate in their local contexts. The concept has been understood as a public good that is generated through increasingly collaborative tools and resources, while supporting public participation in science and Earth stewardship. The key aspects of citizen science relevant in climate science are shown in Figure 1.

c. The multiple evidence approach (MEA). MEA assumes that perceptions and observations of local communities experiencing climate change are legiti-

Field of application	Description of IK practices	Potential for integration	Study Area/Source
Impact identification	Local weather conditions and signs Animals, birds and insect behaviour/signs Astrological constellations/signs Signs from the local environment Signs from flora	Improved impact studies	Kenya (Speranza et al 2010) Zimbabwe (Chanza 2014) Uganda (Orlove et al 2010)
Adaptation			
Use of traditional grains	Traditional grains (sorghum, millet) are drought tolerant and accessible	Enhanced climate change resilience Enhanced adaptive capacity	Togo (Adoukonou-Sagbadja et al 2006) Zimbabwe (Chanza 2015)
Adjustments in farming practices	Planting drought resistant crops and seed s, planting early maturing crops, and stopping to sell their stored grains	Enhanced climate change resilience Enhanced adaptive capacity	Kenya (Speranza et al 2010) Zambia (Mubaya 2010) Zimbabwe (Chanza 2015)
Use of traditional livestock varieties	Indigenous breeds of animals (goats, sheep, cattle, chickens) that can withstand high temperatures and have wider geographic range	Enhanced resilience Enhanced adaptive capacity	East Africa (Radeny et al 2019)
Indigenous food collection & processing	Fruits from trees which grow naturally in the forests or wilderness (e.g., the African shea, *Vitellaria paradoxa* in Burkina Faso & Gambia, A*adansonia digitata* in Zimbabwe & Malawi, *Uapaca kirkiana* and *Ziziphus mauritiana* in Zimbabwe, *Sclerocarya birrea* in South Africa, *Tamarindus indica* in kenya, Malawi, Uganda & Senegal)	Enhanced resilience Enhanced adaptive capacity	Nigeria (Akajiaku et al 2014, Van der Stege et al 2011) Uganda (Ebifa-Othieno *et al* 2017) Zimbabwe (Nyanga et al 2008) South Africa (Wynberg et al 2003)
Use of ash for grain storage	Ash as a grain preservative chemical has a widespread usage among some indigenous African communities. E.g., maize cob ash contains certain natural salts which become toxic for growth and habitation of weevils	Enhanced resilience Enhanced adaptive capacity	Zimbabwe (Gadzirayi *et al* 2006, Mutandwa & Gadzirayi 2007, Chirimuuta & Mapolisa 2011, Matsa & Mukoni 2013), Malawi (Kamwendo & Kamwendo 2011) Kenya (Waithaka 2011) Sudan (Ibnouf 2012)
Mitigation	Ecosystem protection & management Tree planting Reducing deforestation Forest protection Avoiding air pollution Conservation farming	Ecosystem based adaptation UN-REDD+ Climate smart agriculture	Sahel (Senegal, Gambia Mauritania, Mali, Burkina Faso, Niger, Chad, Sudan) (Nyong et al 2007) Zimbabwe (Mandondo 1997, Chanza & de Wit 2016)

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mately scientific and should be used to enhance understanding of climate change, and to subsequently guide climatic interventions. The prospects of this approach span the broad range of climate change science - from understanding climate change indicators to the formulation of mitigation and adaptation strategies that are acceptable and adoptable at local levels.

We see some phenomenal interest in MEA largely owing to the following reasons:

- Growing recognition that climate change is too complex and can be better understood by drawing from other knowledge forms such as IK. E.g., Comparing local indicators with existing knowledge in the climate science domain can strengthen and enrich climate impact assessment studies.
- Local knowledge of climate change impacts can improve our understanding of the localized responses of the physical and biological systems to climate change. For example, this can give useful pointers on how local socio-ecological systems influence ecosystem-based adaptation (EBA).
- The growing agenda in climate change governance where decisions to devise climatic interventions should involve communities who are affected by the outcomes.
- Public involvement in participatory climate assessment (e.g., through citizen science) holds the potential to increase local agency and success of climatic projects.

HOW CAN THE CLIMAPAFRICA PROGRAM CONTRIBUTE TO ADRESS THE CHALLENGE?

There are a variety of ways in which the ClimapAfrica Programme is contributing to the use of indigenous knowledge in climate change science. Firstly, the formation of the working group on climate change and Indigenous Knowledge has enabled the postdoctoral fellows and the DAAD alumni, working on areas related to climate change and indigenous knowledge to share experiences, skills, knowledge and resources to advance this area. Secondly, the programme provides a platform where members of the working group on climate change and indigenous knowledge interract with other working groups, to learn from each other. Thirdly, ClimapAfrica programme is also supporting conferences and summer schools where working group members interract with practitioners, researchers, policy makers and other stakeholders across the globe to engage them on issues around indigenous knowledge and climate change as well as policy advocacy issues. Fourthly, the programme is also expected to link the members of the working group with experts and resourceful people or institutions across the globe that can support the work of the working group technically. The collaboration of policy makers, practioners, and researchers is expected to provide a platform where issues of indigenous knowledge for climate services will be shared, including policy implications, as well as what communities can do to promote climate change mitigation and adaptation. The collaboration will enable policy makers and practitioners to look at policy and practice from the indigenous people's perspective.

The thematic working groups are composed of postdoctoral fellows and African alumni of German funding initiatives with expertise in the field of climate research. **LINK to climapAfrica working group: Climate change and Indigenous Knowledge**

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LINK to profiles of all climapAfrica postdocs fellows of this working group

LINK to profiles of all climapAfrica alumni experts of this working group

PHOTOS AND GRAPHICS

p1: Drought tolerant traditional crops (sorghum, above and pearl millet, below) ©ICRISAT - Zimbabwe (Source: http://www.icrisat.org/what-we-do/crops/PigeonPea/Archives/ippbsa_pm.htm), Participatory plant breeding in Southern Africa, Namibia | p2: Participatory climate impact assessment in Mangwe, Zimbabwe (Photo taken by Nelson Chanza, 2018) | p3: Indigenous breeds of goats (Kalahari red, left and Indigenous Veld, right) (Source: https://www.goatfarming.in/kalahari-red-goat-breed-information; https://www.namibian.com.na/153320/archive-read/Indigenous-veld-goat), The Kalahari red name comes from the Kalahari Desert which spans the boundaries of South Africa, Botswana and Namibia. As such this breed is adapted to hot climates and is resistant to parasites and diseases. The Indigenous Veld is bred for functional efficiency; they are antelope-like with longer legs, so they move with ease and can walk long distances, to either graze or browse on a variety of plants. | f1: Key aspects of citizen science relevant in IK integration | t1: Examples of IKS integration in climate change