

# INTEGRATING INDIGENOUS KNOWLEDGE SYSTEMS (IKS) TO CLIMATE CHANGE ADAPTATION IN SOUTH AFRICA: LESSONS FROM THE “PAST”

**T. S. Madzivhandila**

Turfloop Graduate School of Leadership

University of Limpopo

Polokwane, South Africa

<https://orcid.org/0000-0003-0793-233X>

## ABSTRACT

For a long period of time, what is termed scientific knowledge and discoveries have constantly ignored the existence of indigenous practices and knowledge. Until recently, indigenous knowledge systems (IKS) were not acknowledged when it comes to responding to the ailing world. IKS includes information created inside inborn social orders, autonomous of, and earlier to, the appearance of the cutting-edge logical information framework. It can relate to issues such as conserving nature, food production, forestry development and medicine, to mention a few. The purpose of the article is to discuss the importance of the integration of IKS and culture into climate change adaptation. This article makes the case that scientific interventions among the impoverished in rural developing nations are viewed as foreign and are thus not accepted by the local populace. Consequently, the scientific approach by development experts, and the complex nature of climate change and its understanding, has had no impact on people's adaptation in rural areas, where most of the people still rely on IKS to survive. This theoretical article focuses on the implications of IKS for climate change adaptation. The question the article intends to answer is, with the advent of climate change in recent years, how are rural communities coping with its impact? How is the scientific understanding of climate change with its complexities filtering down to the indigenous communities' coping and adaptation activities? The article's conclusion demystifies the notion that the impact of climate change might be mitigated, and repair achieved solely by scientifically developed measures against it. The article intends to contribute towards building knowledge that acknowledges the importance of different sources of interventions towards addressing climate change. It is important for the current and future professoriate to look beyond the conventional understanding of dealing with challenges such as climate change that the world is facing.

**Keywords:** Indigenous Knowledge Systems, climate change adaptation, rural areas, culture, South Africa

## INTRODUCTION

Indigenous knowledge is important in disaster risk management. According to the Sendai Framework for Disaster Risk Reduction 2015–2030, “understanding disaster risk” is also

priority number one. It says that in disaster risk assessment and in the creation and execution of policies, strategies, plans, and programs for certain sectors, it is necessary “to ensure the use of traditional, indigenous, and local knowledge and practices, as appropriate, to complement scientific knowledge” (United Nations 2015, 15). When it comes to addressing the process of adapting to climate change, this statement cannot be overstated, especially considering the overwhelming evidence that western techno-scientific approaches are increasingly insufficient to address the complex web of social, economic, political, and environmental challenges of today (Thinh, Mu, and Mul 2007). Climate change has adversely affected people across the globe, most impacted are emerging nations, such as those in Africa and India, where most impoverished indigenous people live. In these areas, a significant obstacle to food production, climate change has resulted in food poverty and hunger. (Kugara, Madima, and Ramavhunga 2022, in Tshifhumulo and Makhanikhe 2022; Zvobgo et al. 2022). This is because climate change shows up as severe and/or recurrent natural disasters, particularly droughts, floods, and cyclonic storms.

In Africa, extreme weather events like heatwaves, landslides, and floods are becoming more frequent due to climate change, resulting in greater loss and destruction (Intergovernmental Panel on Climate Change (IPCC) 2014; Ali and Erenstein 2017). Devastating effects have resulted from these weather events, including an increased risk to food security, insufficient availability of water resources, reduced biodiversity, a drop in the viability of human health, and an increase in land degradation (Kugara et al. 2022b). Given all these difficulties, adapting to climate change requires a comprehensive strategy. Acknowledging the significance of indigenous knowledge systems is part of this. Some research institutes and non-governmental organizations in nations like Vietnam have acknowledged the importance of indigenous knowledge in recent years (Mu and Mul, 2007). But it is challenging to preserve and advance IKS because of several issues, including economic development, poor policy, and environmental deterioration. For example, most government organizations and many other stakeholders in the contentious field of climate change have tended to favour and privilege western scientific interpretations over “indigenous” interpretations based on indigenous epistemologies, even though IKS is recognized in countries such as South Africa (DST 2004) (Kugara et al. 2022b).

This article aims to address the significance of incorporating IKS into the process of climate change adaptation in developing nations. The discussion starts by breaking down and redefining IKS. A summary of some of the primary difficulties in adapting to climate change follows this. After a discussion of how IKS might be integrated into climate change adaptation, policy implications and future directions are discussed.

## CONCEPTUALISING INDIGENOUS KNOWLEDGE SYSTEMS

Through their traditional knowledge and customary rules, each ethnic group has developed its own core beliefs and methods for conserving and using natural resources (Thinh, Mu, and Mul 2007). “Indigenous people have frequently adapted to environmental change through techniques and approaches using knowledge transmitted both orally and in practice from one generation to the next, born out of their long-term experience and experimentation” (The and Ahmad 2021, 25, in Tshifhumulo and Makhanikhe 2021). The indigenous knowledge of ethnic minorities is passed down from generation to generation through social practices. It is through the past events that knowledge and experiences have been generated and handed down to next generations using oral practices. The idea behind this process is that the knowledge and experiences become useful in guiding and regulating social relationships between people and nature (Thinh, Mu, and Mul 2007; Dukor 2014; Mafukata 2015; Manyozo 2018; Kom et al. 2022). Moreover, indigenous people create, improve, and uphold a variety of coping mechanisms on a local or regional level based on this process when faced with adversity. A few of these tactics include conserving water ponds and wells to supplement the water supply with new or alternative sources and planting deeply rooted trees to conserve forests. To address environmental difficulties that affect the communities’ livelihoods, measures including community protection and the enforcement of conservation laws like rotating grazing and stall-feeding animals are also implemented.

For instance, these techniques are employed to deal with unfavourable environmental circumstances that may arise in their communities (Mafongoya 2018). Karki, Pokhrel, and Adhikari (2017) list these circumstances as having an impact on livelihood activities related to water and land use, as well as weather forecasting. Other operations include the production of forestry products, such as firewood, medicinal herbs, and materials for handicrafts, as well as the production of food, such as raising cattle and poultry and the storage, processing, and gathering of food. Ethnic minorities have been living for many centuries in various parts of the world, following intricate cultural norms and regulations that have effectively governed human activities to integrate and mix them with the natural environment (Thinh, Mu, and Mul 2007). Indigenous knowledge systems (IKSs) have been used for a very long time all throughout the world, but especially in Africa. Depending on the needs of the civilization, IKS has been employed for a variety of purposes by societies in Africa and throughout the world (Makwara 2013). For instance, like Africa, indigenous knowledge systems (IKS) are widespread and varied in upland Vietnam in all areas of development, such as health care, farming practices, biodiversity conservation, and plant and animal diversity (Thinh, Mu, and Mul 2007). Other

examples include practices by farmers in countries such as Nepal, where residents of the hills have created agroforestry methods to combat high rates of soil erosion, landslides, drought, and frequent flooding. Among these include building bamboo homes that are flood-resistant and both economical and time-efficient. IKS has been utilized to manage water by keeping up with conventional irrigation systems run by farmers. However, according to Mafukata (2015), IKS presents complex processes and understanding including those that are supernatural. This knowledge encompasses, but is not restricted to, occult practices and rituals manifested in festivals and one-on-one interactions with paranormal beings.

Spiritual relationships and interactions with individuals who possess supernatural qualities drawn from their surroundings, which explains the profound religious beliefs of societies in gods, are extremely significant, particularly for Africans (Mafukata 2015). Unfortunately, the complexity surrounding this part of IKS has been the basis for the modern scientific community's criticism. According to Mafukata (2015), most scientists consider these behaviours and beliefs to be illusions, fantasy, mythical, deeply ingrained primordial religiosity, and spirituality. Indigenous knowledge has historically been associated with a lack of modernity and civilization in many parts of the world, particularly when discussing practices in Asia, Latin America, Africa, and the global south in general (Manyozo 2018). Moreover, most contemporary socio-cultural anthropologists frequently take use of the flaws in African belief systems to make claims about their incoherence, for example. Mafukata (2015) asserts that most, if not all, of these belief systems are doubtful of their authenticity and validity due to their lack of coherence.

Planners and technicians involved in development and environmental issues typically focus on contemporary, frequently Western-derived technologies rather than using local knowledge, which is regarded as archaic. On the other hand, a few social scientists have permitted a re-examination of the critical role that indigenous knowledge plays in the practices and theories of development and good governance. They understand that strengthening indigenous competence is essential to local communities' empowerment and their successful involvement in the development process (Kugara et al. 2022a). According to Kieu et al. (2020), for instance, soil erosion rates typically decline when farmers include IK into their farming operations. Thus it is important to consider different avenues including indigenous knowledge when dealing with challenges such as climate change adaptation.

## **CLIMATE CHANGE ADAPTATION CHALLENGES**

Adaptation to climate change is a challenging process, particularly in countries with adverse socio-economic conditions and inadequate infrastructure. For example, South Africa has had

difficulty adapting to stresses associated with climate change, such as heatwaves, flooding, and drought. For instance, the flooding that occurred in the KwaZulu-Natal province of the country in 2022, had a devastating impact and caused destruction to infrastructure, damage to water and electricity supply, and the displacement of households (Madzivhandila and Maserumule 2022). The and Ahmad (2021) describe adaptation as the modification of natural or human systems in response to actual or predicted climatic stimuli or their effects, which mitigates harm or takes advantage of advantageous chances. Successful climate change adaptation in agriculture may involve several factors, including farmers' perceptions of the change, their adaptation strategies, factors that are effective, and obstacles to their adaptation (The and Ahmad 2021; Tshifhumulo and Makhanikhe 2021; Kugara et al. 2022a; Kugara et al. 2022b; Zvobgo et al. 2022). In this context, popular adaptation measures include adjusting planting and harvesting schedules, crop protection techniques, irrigation and fertilizer control systems, tillage techniques, and farm finance management.

It has been discovered that further adaptation techniques, including as modifying irrigation systems, using crops tolerant to stress, adjusting sowing times, and altering the types and applications of fertilizers, might help lessen susceptibility to climate change (Dixon, Stringer, and Challinor 2014). These strategies are significantly important as most regions in recent times are experiencing irregular rainfall and temperature, which are bringing about a range of natural disasters, including storms, frost, drought, flash flooding, and more severe winters. In addition, pests and illnesses are increasingly common in rice and corn, among other crops. This raises the cost of production by requiring labour and pesticides, which lowers productivity (Kieu et al. 2020). Unfortunately, indigenous people living in rural regions are the communities most impacted by these factors. Temperature and weather patterns are already changing for many indigenous groups, particularly those in Africa. These changes are being exacerbated by historical economic, social, and political marginalization and colonization (Kugara et al. 2022a; Kugara et al. 2022b; Zvobgo et al. 2022). It is often known that indigenous peoples are especially vulnerable to the effects of climate change. Indigenous peoples and other marginalized groups are particularly exposed to, sensitive to, and vulnerable to the effects of climate change since their livelihoods depend on natural resources.

In parts of Africa that rely on rainwater agriculture and have few means to reduce and adapt to it, the enormous repercussions of these are particularly severe. Due to their limited potential for adaptation, indigenous people in these areas are particularly vulnerable to the effects of climate change (Kugara et al. 2022a; Zvobgo et al. 2022). Rising summer temperatures in these locations induce a rise in water demand, which is not entirely satisfied due to a lack of infrastructural development. Additionally, a lack of water or a drought typically

causes the planting schedule to be postponed, which results in lower productivity and a loss of income due to the crop's protracted growth time (Kieu et al. 2020). In countries such as Zimbabwe, for example, these processes have threatened smallholder agriculture production systems and led to food insecurities (Kugara et al. 2022a).

According to Lehner et al. (2006), most regions, including those in Asia, Africa, and Europe, will see an increase in the severity and frequency of droughts and other extreme natural hazards. Crop yields in central Asia are predicted to drop by 30 per cent in the 21<sup>st</sup> century, resulting in malnutrition and other food insecurity related challenges. The negative effects of climate change on agriculture are still anticipated to be severe and unpredictable, according to The and Ahmad (2021, in Tshifhumulo and Makhanikhe 2021). For instance, by 2050, rice yield could drop from 6 per cent to 42 per cent and that of other crops from roughly 3 per cent to 47 per cent (Smyl and Cooke 2017). Adaptation strategies are essential for lessening the effects of these forecasts and are crucial for maintaining farmers' means of subsistence (Ali and Erenstein 2017). However, in order to lessen the effects of climate change, emphasis should also be given to incorporating some of the indigenous knowledge practices, given the high production costs of the widely accepted adaption strategies in terms of energy, pumps, and irrigation.

## **INTEGRATING INDIGENOUS KNOWLEDGE SYSTEMS IN CLIMATE CHANGE ADAPTATION**

It is obvious that creating sustainable adaption strategies is challenging due to the complexity of climate change and its effects. This is particularly noticeable in developing nations with severely constrained and insufficient infrastructure development. Therefore, it is crucial to consider a range of strategies to address the effects of climate change. Africa has a diverse range of cultures, customs, and faiths, much like any other part of the world. The daily socio-economic systems of the peoples are influenced by these cultures, traditions, and faiths in larger ways (Dukor 2014; Musehane 2012). African customs, cultures, beliefs, and experiences continue to influence how Africans respond to life in general, even though many of these things are now considered myths by modern science.

The lives of indigenous populations are greatly impacted by their knowledge, which also helps farmers adapt to the changing environment (IPCC 2014). Mafukata (2015), for example, emphasized that man experiences everything through the lens of his culture, which shapes and marks his experiences by creating the ideas that guide his perceptions of the world, himself, and other people. This means that efforts to assist indigenous communities should in one way or the other integrate their local indigenous practices to be sustainable. The South African

saying “nothing for us without us” plays a major role on this process. Important questions to ask include, for example, how can indigenous knowledge play a role in or be integrated into climate change adaptation? Can modern climate change adaptation efforts work for indigenous communities without considering indigenous knowledge? Bearing in mind that climate change has affected most indigenous communities, how are these communities coping and how can modern and so-called scientific adaptation measures compliment their efforts? Can indigenous people help in developing strategies to lessen the effects of and adapt to climate change?

Responding to these questions will mean adopting a holistic approach towards climate change adaptation. There are currently around 370 million indigenous people living in Africa, Asia, and the Pacific, most of them reside in rural and mountainous regions (The and Ahmad 2021, in Tshifhumulo and Makhanikhe 2021). For millennia, these indigenous people have successfully devised adaptation strategies to address issues with food security and environmental sustainability. According to The and Ahmad (2021, in Tshifhumulo and Makhanikhe 2021), for example, Vietnamese indigenous farmers in mountainous areas use their knowledge of the weather to predict the movements of insects, frogs, and birds to inform farming practices. Similarly, in Zimbabwe, indigenous knowledge is used to forecast rainfall and weather patterns for an agricultural season, which is then applied to crop activities (Thinh, Mu, and Mul 2007). In Thailand, the interplay among people, natural resources, and biodiversity shows the cultural traits of individual ethnic groups in terms of behaviour and natural resource adaptation.

Other examples include the Tay people of northern Vietnam, who use a variety of native plants and alter their planting schedules as major adaptation strategies; the Dao and Hmong people, on the other hand, use intercropping and indigenous methods, terracing their fields with the aid of livestock varieties native to their areas (Kieu et al. 2020). Other methods of land preparation and use that are climate-adapted include the application of indigenous knowledge to forecast and prevent poor weather for agricultural cultivation in many regions of the world, as well as local knowledge of treating cattle diseases. These and many other techniques have been used for a long time due to constant changing weather patterns (Thinh, Mu, and Mul 2007; Kom et al. 2022). Adapting to climate change has also meant changing common practices to adapt to changing seasons. According to Kieu et al. (2020), rainbows in the southern hemisphere indicate the likelihood of a drought. As a result, people are recommended to plant maize and beans instead of rice in such areas. Tay people have evolved individualized methods because they are particularly sensitive to physical changes in their environment. Kom et al. (2022) highlighted that indigenous communities in South Africa are using observations to predict weather patterns that are either favourable or detrimental to their food production

processes. The observations assist these people to make decisions. The presence of murky clouds in the Vhembe district of the province of Limpopo can be read as a sign that there will be heavy rain and an increase in insects. All these methods might be combined to strengthen the current adaptation strategies, which are finding it difficult to address the effects of climate change because of their complexity and the poor socioeconomic circumstances of individuals who are impacted, especially in developing nations. In these areas, most indigenous people do not have access to and cannot afford running water for irrigation and chemical manure, which are used for adaptation by modern and commercial farmers.

## **POLICY IMPLICATIONS AND WAY FORWARD**

The struggle to curtail the impact of climate change should give urgency to the process of developing solutions, particularly for marginalised communities who are extremely affected by climate change. Governments, legislators, and the scientific community must use the most up-to-date information on global climate change in order to do this. Because of the interdisciplinary nature of the effects, understanding climate change requires a comprehensive approach. Kugara et al. (2022a) have observed that there is a gradual recognition of IKS as a crucial information source for both climate mitigation and adaptation. This system should be considered crucial for adapting to the effects of climate change since it has amassed a wealth of indigenous information about weather forecasting and climate prediction based on observations of animals, insects, and plants.

In many regions of South America, Asia, and Africa, IKS is still a vital source of knowledge for indigenous populations. As a result, it ought to be included in the execution of policies for adapting to climate change. Because adaptation and mitigation methods rely on this existing information, which has proven reliable for them, rural people respect their IKS. It is evident in numerous examples that development is either less successful or, in some cases, disastrous when local knowledge is excluded from the planning and policymaking process (Thin, Mu, and Mul 2007). Therefore, it's critical that governments and the scientific community work out how to include indigenous perspectives in discussions of climate change. It is imperative for policymakers to consider the perspectives and knowledge of indigenous farmers when developing policies pertaining to climate change. Furthermore, by combining current climate models with current IKS, policies should be developed to create mitigating and adapting solutions. In the end, this knowledge and its applications should serve as a crucial foundation for attempts to address the even more pressing concerns of climate change for government planners and scientific professionals to succeed in climate change adaptation (Makondo and Thomas 2018).



## CONCLUSIONS

It's critical to dispel the myth that the scientifically developed responses to climate change alone, are sufficient to mitigate its effects and promote adaptation. IKS should be seen as a key component in the battle against the effects of climate change, especially in rural areas where traditional and cultural values still govern daily life. Through their traditional knowledge of rainwater harvesting, traditional agricultural techniques, early warning systems, disaster preparedness and response, traditional fire management, traditional monitoring and reporting of climate changes, and the creation of sustainable livelihoods, indigenous people could contribute to a wide range of potential adaptation strategies. In many regions of the world, IKS is still a vital source of information for local people. Thus, to succeed, experts need to involve local indigenous communities to work with them towards developing climate change-related solutions. IKS need to be acknowledged by both practitioners and the current and future professoriate as one of the solutions to the ailing word. The recommended scientific adaptation solutions that do not address the effects of climate change could include IKS.

## REFERENCES

- Ali, Akhter and Olaf Erenstein. 2017. "Assessing farmer use of climate change adaptation practices and impacts on food security and poverty in Pakistan." *Climate Risk Management* 16: 183–194.
- Department of Science and Technology. 2004. *Indigenous Knowledge Systems Policy*. Pretoria: Department of Science and Technology, Republic of South Africa.
- Dixon, Jami L., Lindsay C. Stringer, and Andrew J. Challinor. 2014. "Farming system evolution and adaptive capacity: Insights for adaptation support." *Resources* 3(1): 182–214.
- DST *see* Department of Science and Technology.
- Dukor, Maduabuchi. 2014. "Philosophical significance of myths and symbols: Zangbeto Cult." *International Journal of Humanities Social Sciences and Education* 1(11): 23–34.
- Intergovernmental Panel on Climate Change. 2014. *Climate change: Synthesis report. The contribution of working groups I, II and III to the fifth assessment report of the intergovernmental panel on climate change*. Geneva: IPCC.
- IPCC *see* Intergovernmental Panel on Climate Change.
- Karki, Madhav, Pallav Pokhrel, and Jam Ram Adhikari. 2017. "Climate change: Integrating Indigenous and local knowledge into adaptation policies and practices: A case study from Nepal." In *Shifting cultivation policies: Balancing environmental and social sustainability*, edited by M. Cairns. Boston: CABI.
- Kieu, Thu Huong, Ngan Nguyễn, Hien Thuong Nguyen, and Hai Anh Vu. 2020. "Indigenous knowledge in climate change adaptation: Case studies of ethnic minorities in the Northern Mountain Region of Vietnam." *Journal of Vietnamese Environment* 12(2): 155.
- Kom, Zongho, Nthaduleni S. Nethengwe, Sylvester Mpandeli, and Hector Chikoore. 2022. "Indigenous knowledge indicators employed by farmers for adaptation to climate change in rural South Africa." *Journal of Environmental Planning and Management*. DOI:10.1080/09640568.2022.2086854.
- Kugara, Stewart Lee, Andrew Tapiwa Tapiwa Kugedera, Nyasha Sakadzo, Emmerson Chivhenge, and Taona Museva. 2022a. "The role of indigenous knowledge systems (IKS) in climate change." In

- Handbook of Research on Protecting and Managing Global Indigenous Knowledge Systems*, edited by R. Tshifhumulo and T. J. Makhanikhe. Pennsylvania: IGI Global.
- Kugara, Stewart Lee, Thizwilondi Joanbeth Madima, and Ndidzulafhi Esther Ramavhunga. 2022b. "The fight against climate change from an indigenous system perspective." In *Handbook of Research on Protecting and Managing Global Indigenous Knowledge Systems*, edited by R. Tshifhumulo and T. J. Makhanikhe. Pennsylvania: IGI Global.
- Lehner, Bernhard, Petra Doll, Joseph Alcamo, Thomas Henrichs, and Frank Kaspar. 2006. "Estimating the impact of global change on flood and drought risks in Europe: A continental integrated analysis." *Climatic Change* 75(3): 273–299.
- Madzivhandila, Thanyani S. and Mashupye H. Maserumule. 2022. "The irony of a 'fire fighting' approach towards natural hazards in South Africa: Lessons from flooding disaster in KwaZulu-Natal." (Editorial). *Journal of Public Administration* 57(2): 191–194.
- Mafongoya, Owen. 2018. "The role of Indigenous Knowledge Systems in seasonal prediction and adaptation to climate change and vulnerability amongst smallholder farmers in Bikita, Zimbabwe." PhD Thesis, University of KwaZulu Natal.
- Mafukata, Abel M. 2015. "Mythical leopards (*Panthera Pardus*) of the Vhavenda." *International Journal of Information Research and Review* 2(7): 836–852.
- Makondo, Cuthbert Casey and David S. G. Thomas. 2018. "Climate change adaptation: Linking indigenous knowledge with western science for effective adaptation." *Environmental Science & Policy* 88: 83–91.
- Makwara, Enock C. 2013. "Indigenous Knowledge Systems and modern weather forecasting: Exploring the Linkages." *Journal of Agriculture and Sustainability* 2(1): 98–141.
- Manyozo, Linje. 2018. "The context is the message: Theory of indigenous knowledge communication systems." *Javnost* 25(4): 393–409.
- Musehane, Ndivhuwo M. 2012. "Commercialisation of legendary stories of the Vhembe District in Limpopo Province: A strategy for economic development of South Africa." *International Journal of Economic Development Research and Investment* 3(2): 80–87.
- Smyl, Jil and Richard Cooke. 2017. *Environmental and Climate Change Assessment*. Rome: International Fund for Agricultural Development.
- Thinh, D., K. Mu, and X. Mul. 2007. "The Role of Indigenous Knowledge in Sustainable Development: A Case Study of The Vietnam Mountain Regions." *Studies of Tribes and Tribals* 1: 215–224.
- Tshifhumulo, Rendani and Tshimangadzo J. Makhanikhe. (Ed.). 2022. *Handbook of Research on Protecting and Managing Global Indigenous Knowledge Systems*. Pennsylvania: IGI Global.
- United Nations. 2015. *Sendai Framework for Disaster Risk Reduction 2015 – 2030*. New York: UN.
- Zvobgo, Luckson, Peter Johnston, Portia Adade Williams, Christopher H. Trisos, and Nicholas P. Simpson. 2022. "The role of indigenous knowledge and local knowledge in water sector adaptation to climate change in Africa: A structured assessment." *Sustainability Science* 17: 2077–2092.