

## Article

# Translating Indigenous Knowledge into Actionable Climate-Change Adaption Strategies: A Case Study of Maluti-a-Phofung Local Municipality, Free State Province, South Africa

Shadreck Muchaku <sup>1,\*</sup> , Grey Magaiza <sup>1</sup> and Hamisai Hamandawana <sup>2</sup><sup>1</sup> Centre for Gender and Africa Studies, University of the Free State, Phuthaditjhaba 9866, South Africa<sup>2</sup> ARU-Risk and Vulnerability Science Centre, University of the Free State, Phuthaditjhaba 9866, South Africa

\* Correspondence: Muchaku.S@ufs.ac.za; Tel.: +27-730-750-166

**Abstract:** Although the literature concerning vulnerabilities to climate change (CC) has been growing, research continues to be silent on approaches that can enhance the adaptive capacities of resource-poor communities that are vulnerable to the adverse effects of CC by translating indigenous knowledge (IK) into actionable adaptation strategies. This assertion is premised on the absence of concerted efforts to incorporate IK into science-based adaptation strategies. We attempt to address this gap by using a multidisciplinary investigative approach that taps into the perceptions of local people in the Maluti-a-Phofung Local Municipality in the Free state province of South Africa and what is available in the literature. This approach is helpful because it ensures that local people's perceptions, alongside other objectively informed insights, are systematically integrated into the co-designing of actionable climate-change adaption strategies. Given these and other considerations, we invite the scientific community and those interested in sustainability to complement our efforts by providing suggestions on the way forward.



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## 1. Introduction

Globally, there is growing recognition that translating indigenous knowledge (IK) into actionable, climate-friendly interventions is vital for mitigating the adverse effects of climate change. Discursive narratives on the translation of actionable climate change adaptation strategies must be informed by the knowledge and wisdom of those whose livelihoods continue to be adversely affected by the impacts of climate change [1]. This reasoning is premised on the widely accepted recognition that, although IK has tremendous potential to contribute to developing effective climate change adaptation (CCA) strategies, the current guidelines continue to yield suboptimal results [2,3]. Although this is the case, the utilisation of IK in mainstream CCA strategies is still limited [2,4]. In most cases, the development of the current approaches has often excluded important traditional methods in the CC mitigation process [5,6], despite the fact that indigenous people occupy or use a quarter of the world's surface area and safeguard 80% of its remaining biodiversity [7]. The legacy of trivialising IK has often resulted in the increased vulnerability of resource-poor rural communities to CC risks and threats [3,8]. This challenge demonstrates the immediate need to streamline the terms under which IK can be translated into actionable CCA strategies.

CC is a broad concept that involves long-term variations in temperature and precipitation for extended periods in the order of several decades [1,9]. These sustained changes in weather conditions are associated with the deterioration of people's livelihoods in all strata of society [1]. For example, several regions of the world are now experiencing an

increase in erratic rainfall patterns and extreme events, such as heatwaves, floods, and severe droughts [10]. In all countries worldwide, the worst affected are always resource-poor communities with limited adaptive capacities to cope and adapt due to the dependence of their livelihoods on rain-fed agriculture. This dependence renders these communities extremely vulnerable to food and nutrition insecurity (FNI) [4,6]. Although research can address these challenges by moving knowledge from the laboratory, academic conferences, and research journals into the hands of people and organisations who can put it to practical use [5,11], practical implementation is minimal. This is aggravated by the fact that few studies have been conducted to explore how IK can be used as a complementary source of insights that can be used to improve the adaptive capacities of rural people to the adverse effects of CC.

Although no region can escape the risks associated with CC, the worst affected are always rural communities in most developing countries, including South Africa, due to the dependence of their livelihoods on rain-fed agriculture [2]. The reasons explaining this include illiteracy [4], the lack of facilities to support technological requirements [7], and the gradual erosion of IK [2]. Hence, several communities struggle to implement the existing scientific guidelines on CCA [4]. However, arguments are made against the relevance of IK in modern times [5]; the above highlights the challenges in weaving science-based knowledge and IK together and the need to promote integrated and generative responses to the current and anticipated/projected CC challenges. As CCA is not exclusively dependent on IK, it is necessary to determine the degree to which it should be relied on by rural communities and how it can be translated and integrated into modern science.

In instances where initiatives on the use of IK in CCA may be successful, their impact is often limited by their small scale of implementation [8]. Broadly, scientists have little interest in the potential that IK utilisation offers for the effective adoption of CCA strategies. This shortcoming needs to be addressed by proactively acknowledging that the magnitude of the current climate challenge requires new ways of thinking and practice across different knowledge systems. Given the complexity of this challenge and the obvious weaknesses of the current approaches, CC will remain one of the biggest challenges for a long time into the future, and the need to explore innovative ways through which IK and modern science can be integrated is long overdue [2,9]). There is an urgent need to implement this because IK is already available, and there is tremendous potential to effectively use it to provide hope and sustainable livelihoods to communities that are vulnerable to the effects of CC. This paper attempts to achieve this by providing insights on how researchers can innovatively scale up the translation of IK into responses that address the current and anticipated problems of CC. Despite the realisation that traditional approaches to CCA are grounded in progressive sustainability principles in South Africa [1] and other developing countries worldwide, there is a lack of interest in integrating IK into science-based adaptation strategies [7]. This partially explains why rural communities have not been able to harness this untapped source of CCA strategies [10]. As a result of this, the readily accessible IK knowledge in rural communities has not been able to offer practical solutions. Although IK is critical for adopting CCA strategies, evidence in the literature suggests that it continues to be trivialised and under-utilised in global conservation efforts [12]. This needs to be addressed by rethinking community-level approaches to CCA.

The local level must be prioritised because it allows global strategies to be translated into action [7]. It is also helpful because it: (1) provides implementation pathways that are attractive and inherently local; and (2) confers a sense of ownership that encourages the uptake and implementation of CCA strategies [2,6]. The available evidence shows that policymakers and development agents are increasingly voicing their dissatisfaction with the performance of CC adaption strategies, most of which are not translatable into actionable adaptation strategies [3]. Given the lack of unanimous agreement on which of these approaches is better and whether a combination of both would deliver improved results, there is an urgent need to formulate strategies that can be used to harmonise our approaches to the embracement and adoption of actionable CCA interventions. We attempt

to achieve this by providing objectively informed insights from the literature on the gaps that need to be bridged and how using IK can aid the delivery of effective CCA strategies.

## 2. Insights from the Literature

In recent times, the climate risk index (CRI) has indicated that over 50% of developing countries, such as Kenya, Madagascar, and Ruanda, are more exposed to the devastating impacts of CC compared to developed countries of the global north [13,14]. Although the literature provides replete evidence of the successful implementation of CCA strategies, most of these strategies tend to be effective in more industrialised countries. [15]. These strategies may not apply to underdeveloped localities in developing countries because of their limited capacity to adapt and their limited experience in environmental conservation [1]. Nevertheless, recent studies on CC focus on the generation of knowledge SK, which lacks a rural context, where a substantial proportion of the CCA strategies must be implemented [1,2]. In these areas, there is a lack of awareness, knowledge, and clarity on what is practically implementable and how this implementation can be achieved. The failure of science-based strategies to deliver explains why South Africa's government is under pressure to promote the translation of IK by using it synergistically with scientific approaches [3].

### 2.1. Barriers to IK Translation into Actionable CCA Strategies

Several factors that include relevancy, compatibility, adaptability, and many others, explain why there is a lack of traction in translating IK into actionable CC mitigation strategies in most developing countries. These limitations can vary considerably across different communities, cultures, and countries. The following subsections (Sections 2.1.1 and 2.1.2) provide a literature-based overview of how some of these factors impact the translation of IK into action-oriented climate-smart adaptation strategies, and there is considerable potential to achieve this in South Africa [16,17] and other developing countries, worldwide [18–21].

#### 2.1.1. Debate on the Relative Relevancy of Scientific and Traditional Knowledge

As identified in the literature, the trend indicates that IK is a vital source of local-level CC adaptation strategies ([22–25]). Despite its benefits, the future of IK is likely to continue being overshadowed by apathy among young people, scientists, and policymakers, as observed by Muringai et al. [12]. Mkwanazi et al. [3], who report that the assimilation of IK into modern science-premised CC adaptation continues to be trivialised as irrelevant. This is evidenced by an increasing recognition of the fact that science-driven interventions alone are not capable of delivering porismatic CC adaptation interventions. This assertion is supported by Mkwanazi et al. [3], who reports that, in South Africa, western knowledge systems continue to view IK as inferior to the extent that there is a need to formulate strategies on how it can be assimilated into the prevailing narratives on the potency of modern classical science. Interestingly, however, some scholars, i.e., Nyahunda and Tirivangasi [10], contest the validity of the exclusive use of SK by positing that its exclusion of IK renders the CCA strategies ineffective. Proponents of this view consider IK as critical in the ongoing attempts to confront the impacts of CC by arguing how resource-poor communities in rural areas live, and their livelihoods are rich sources of informative insights on the sustainable use of the limited natural resources at our disposal [6,15]. These insights demonstrate that it is helpful to tap into our multidisciplinary knowledge, rather than selectively relying on narrowly construed discursive narratives.

#### 2.1.2. Incompatibility and Failure to Adapt to Climate Change

Robinson [26] found that the failure of IK to adapt in modern times is one of the critical factors determining its usefulness in enhancing the adoption and practical implementation of CCA interventions. This narrative is supported by the findings of previous studies on indigenous people, which point to the fact that indigenous knowledge is unintellectual and

primitive [9]. The other argument from this line of thinking is that adapting IK is based on IK's lack of responsive inclusiveness by trivialising the inclusion of women. This implies that women's voices are excluded in the development of CCAs. Although this continues to prevail, there is an urgent need to revisit the approaches by Muringai et al. [12], who argue that IK has always been denied the space to adapt. Thus, a greater understanding of the benefits of adapting IK in modern practices must be embraced if society is to be appropriately positioned to address the challenges of CC meaningfully.

Although the literature on IK is continuously growing, more work is still required to provide valuable insights into the usefulness of IK in combating the challenges associated with CC. While several challenges undermine the effective inclusion and utilisation of IK in CC mitigation, further efforts are required to address these challenges. Studies addressing how IK can be used to enhance our capacities to adapt are few. Nevertheless, the few available by Dastgerdi et al. [7] are now beginning to encourage the recognition of the need to assimilate IK in CC adaption strategies. This reasoning is informed by the increasing recognition that IK is a critical component of implementable CC adaptation strategies. Accepting and assimilating this recognition can motivate local communities to willingly adopt CC adaption strategies, most of which are often resisted because they are widely perceived impositions by outsiders. This observation prompted us to contribute to the discourse on climate CC adaptation by providing insights on how the effective use of IK can aid the adoption of climate-friendly interventions.

### 3. Theoretical Framework

The theoretical framework on which this study is based was guided by Ernest Boyer's engaged scholarship model [27]. The paper argues that investing in IK creates the foundation for actualising Boyer's engaged scholarship model. We decided to use this model because of its potential capabilities to enhance the assimilation of IK in ongoing initiatives to adapt to the challenges of CC and acknowledged recognition of the fact that doing so will help bring synergy between IK and modern science [28,29]. Unfortunately, however, advocates of CC adaptation have not been able to effectively use Boyer's pioneering model in mitigating the adverse effects of CC [2,4]. This deficiency explains why we decided to use this model to interrogate why the use of IK in formulating and implementing CC strategies has not gained traction at the community levels where action is required.

### 4. Materials and Methods

#### 4.1. Research Design

To better understand the CC adaptation discourse, the study collected data based on descriptive and exploratory research designs. The study's sample included community members from the Maluti-a-Phofung Local Municipality (MaPLM), following the procedures that are explained in Section 4.2, below. The descriptive research design was employed because it accommodates various multidisciplinary research methods [30], whereas the exploratory research design provides space for the rigorous exploration of complex issues [31,32]. This reasoning explains why we saw it fit to explore how the translation of IK can help to tailor and complement existing climate change knowledge and expertise in rural communities.

#### 4.2. Population and Sample Size

A multiple-phase purposive sampling procedure was used to enhance the solicitation of qualitative data from best-fit respondents, as suggested by Saks et al. [33], and to obtain scientifically premised insights on what needs to be conducted and how [30,34]. During the first phase, two wards were purposively selected from a sampling universe of 31 wards in MPLM, the Free State province, South Africa. These wards were chosen based on agricultural productivity and their perspectives on why it is difficult for them to adopt the MDG's sustainable development goals for CC. After that, we selected two villages from each of these two wards. These villages were selected because of

their heavy reliance on subsistence farming, one of their principal sources of livelihood. The selection of these wards and villages was based on advice from agricultural extension officers with verifiable knowledge of these communities. During the second phase, 16 participants were purposively chosen from each of the targeted villages, with the solicitation of information being targeted at community members older than 40 years of age. The 40 year age limitation was used because it was reasoned that informants above this age limit have reliable memories and insights on how IK can be meaningfully exploited to advance the CC adaptation agenda. A total of 28 respondents participated in the study from the two villages: Monontsha, village 13, and Pereng, village 15. These villages provided a representative sample with twenty-eight respondents that included eighty community members, four community leaders, and two officials from the Departments of Agriculture, Environmental Affairs, Department of Arts and Culture, and NGOs. This sample was further boosted by including six representatives of women and two representatives of commercial farmers, as shown in Table 1, below.

**Table 1.** Summary of the respondents to in-depth interviews and focus group discussions that were conducted in this study.

Study Area	Ward 34	Summarisation of Respondents by Gender				Turn-Up Rate (%)
		Targeted	Accessed	Women	Men	Accessed
Village code	Village name					
a	Monontsha	16	13	5	8	81.25
b	Pereng	16	15	3	12	93.75
Total	-	32	28	8	20	-

## 5. Results and Discussion

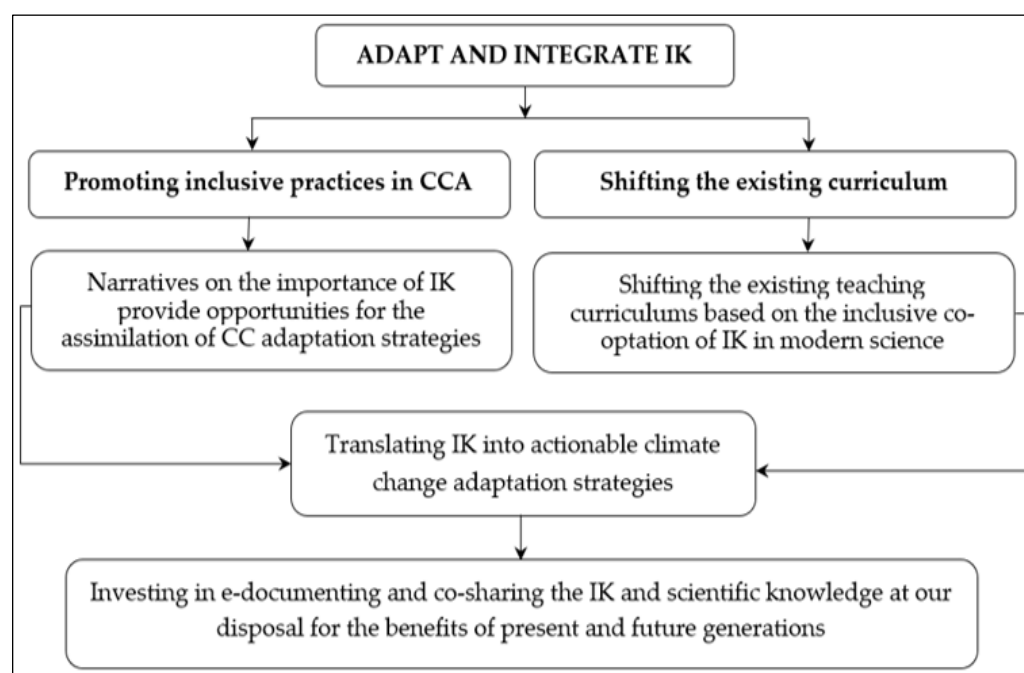
This section presents and discusses the results of this study. The case study results show that IK provides a sound basis for local-level decision insights in predicting, interpreting, mitigating, and adapting to CC risks in rural areas. Although this study's respondents provided various strategies to promote the translation of IK in CC mitigation, they reported that they faced challenges, which are discussed in Section 5.1, Section 5.2, Section 5.3, and Section 5.4, below.

### 5.1. Adapt and Integrate IK Elements into Climate Change Mitigation

The participants were enthusiastic about the prospects of integrating IK into mainstream research. The government officials who were interviewed argued that communities could better adapt to the impacts of CC by adopting strategies that integrate IK and SK (Figure 1).

All of the participants from whom information was solicited expressed concerns about the failure of some scientific-based initiatives to enhance CC adaptation in their communities. The respondents also highlighted that, although they try to adhere to the scientific guidelines, they produce suboptimal CC adaptation results. A closer analysis of this finding reveals that although SK alone is inadequate, it can produce better results by integrating IK. The other submission by most respondents was that there is a need to formulate strategies that can be used to address the limitations of the current science-based strategies. In response to the question, Are there any community-based CC mitigation guidelines in the Maluti-a-Phofung local municipality?, one government official indicated that most of the current strategies are primarily based on modern science because of the persevering tendency to trivialise IK. This bias partially explains why we will take time to embrace actionable CC adaptation strategies.





**Figure 1.** Pathways to promote the translation of IK into actionable CC adaptation strategies.

### 5.2. Invest in E-Documentation and Printing of Indigenous Knowledge

The findings of this study revealed that one of the challenges that undermine the use of IK in mitigating the challenges confronting society's potential to assimilate the meaningful adoption of CC adaptation strategies is the lack of modernisation. This asseveration is supported by the participants of this study who revealed that the transmission of IK from one generation to another is hindered by the exclusive dependence on undocumented oral channels. The above is problematic because it limits the intergenerational transfer of IK from society's elders to younger individuals within their immediate circles of association. This assertion is supported by Jamshidi et al. [9], who argue that it is challenging to integrate undocumented IK with its science-based equivalent. To address this problem, 60% thought the teaching curriculum must be revised so that SK and IK are harmoniously integrated to enhance the synergetic utilisation of knowledge from both spheres. This approach is helpful because it creates space for scientists to perceive IK as a legitimate and complementary source of knowledge. This is supported by 80% of this study's informants in Phuthaditjhaba, who reported that IK vested in local communities is beneficial because they are the custodians of their environment and are better able to implement viable adaptation strategies because they have vested interests in doing so. IK is also beneficial because it provides a powerful means of enhancing the wilful adoption of implementable CC adaptation strategies [30] because it can be receptively used to help communities to adapt to CC risks based on their previous experiences [34,35]. Given this and other considerations, we urge those interested in exploring how IK can contribute to CC adaptation to provide insights on how documented knowledge storage from different domains can enhance our capacities to tap into what we already have.

This asseveration is supported by the views of most of the respondents (80%) who were concerned about the stereotypical nature of SK, particularly in terms of environmental conservation, where IK is widely considered to be unworthy of archiving in digital information platforms. One of the most exciting results of the study was that libraries had increased access to scientific and IK resources closer to community members. These schemes have increased the access to indigenous knowledge; however, there are still some limitations relating to the documentation of IK and its transferability. For example, during one of this study's focus group sessions, 20 of the 28 participants indicated that the provisioning of electronic and printed material on indigenous knowledge is continuously overlooked in

Phuthaditjhaba. Some challenges that add to this complexity include the need for more funding to support indigenous studies. This concern deserves attention because it impedes the co-optation of IK in ongoing adaptation strategies, which argues for researchers to consider the need to adopt an embrative approach. However, a more realistic option is to embark on face-to-face information sharing by engaging the semi-illiterate and illiterate members of the community. An inclusive investment practice could yield more sustainable, organic outcomes by empowering and capacitating disadvantaged people to determine the fate of their livelihoods.

These findings concur with emerging ideas on the need to acknowledge that IK can enhance our abilities to cope with the challenges of CC. This assertion is corroborated by evidence in the literature on why IK's adaptation strategies continue to be trivialised. This trivialisation appears to be based on the contested recognition of the reliability of IK, with some scholars arguing that the wisdom and knowledge it provides have not been scientifically verified, and others refuting this by maintaining that it provides a rich source of informative insights. For example, key informants indicated that the attempts by scientists to reduce atmospheric CO<sub>2</sub> concentrations through the planting of trees have several downsides, that include: (1) the persistent depletion of groundwater resources in low rainfall areas; (2) this facilitates the conversion of potentially usable agricultural land to forests; (3) the loss of biodiversity by converting naturally vegetated areas into single vegetation types; (4) the incompatibility of this intervention with sustainability in areas affected by bush encroachment where the use of fire to control this phenomenon reverses the benefits of revegetation; and (5) the lack of information concerning how to dispose of those trees when they die. Implicit in these above-listed observations is the fact that science is providing contradictory recommendations because using fire to control bush encroachment releases more CO<sub>2</sub>, which revegetation is trying to control. The participants of this study considered the recent responses to CC risks as largely reactive. Evidently, they were sceptical about the prospects for the meaningful co-optation of IK in science-based adaptation strategies.

Further, they indicated that the isolated use of science would not offer broad-based assimilation or implementation of tangible CC interventions. The loss of IK can be caused by wide-ranging factors, including a lack of confidence in what it can offer, migration leading to a reduced capacity to implement indigenous practices in combating climate change and the conviction that it is premised on wisdom that is challenging to verify. Contrary to these widely circulated narratives, the evidence supports that the IK domain has substantial potential to aid modern science in enhancing our capacities to adapt to the challenges of CC.

This assertion is supported by their awareness of how ongoing CC mitigation projects that include reforestation, conservative use of declining water resources and many others fail to gain traction. Regarding the various threats associated with CC, the community members revealed that their environment faced wide-ranging threats from these interventions, such as CO<sub>2</sub> sequestration through revegetation. In contemporary academic jargon, scientists recommend eradicating invasive alien species to enhance the responsible stewardship of the resources at our disposal. This reasoning suggests that CC strategies must be embraced in tandem with how the beneficiaries are expected to implement them because prescriptive approaches always incite resistance. This is because there is an urgent need to accommodate the singular distinctions of different environments due to the demonstrated failure of SK to deliver tangible results and outputs on how society can realise actionable CC adaptation strategies. This is because an overreliance on SK can lead to the hear-say adoption of narrowly construed policy-prescribed interventions that are not practically implementable. A closer analysis of this investigation's results shows that exclusive abidance with the scientific-based approach is likely to be supported or aided with local communities', and other stakeholders', support and involvement. This argues for the need to accommodate local communities' perceptions of how society can adjust to the persevering challenges associated with CC. This article, therefore, argues that indigenous

knowledge systems offer tremendous opportunities to contribute to modern science and CC adaptation.

### 5.3. *Promoting Inclusive Practices in Climate Change Adaptation*

Some community members (30%) indicated that the current guidelines for CC adaptation are not adequately responsive to cultural norms (Figure 1). This is supported by Dastgerdiet al. [7], who acknowledge that the inclusion of IK in CC adaptation strategies is conspicuously lacking to the extent that there is an urgent need for the scientific community to reinvent how the knowledge at our disposal can be translated into actionable interventions. This is further supported by Frantzeskaki et al. [2], who posit that, although the role of IK in CC adaptation continues to be trivialised, there is room for the proactive enaction of this discursive narrative. Similarly, the respondents in this study highlighted that community members had lost interest in cultural practices as IK systems are now widely considered to be outdated. Contrary to this view, scholars such as Karimi et al. [4] argue the IK at our disposal has not been afforded enough room to adapt. This reasoning is informed by the fact that communities in the Maluti-a-Phofung Local Municipality cherish the importance of socially transmitted practices and their day-to-day livelihoods' sacredness. This asseveration is prompted and informed by the rich intergenerationally transmitted knowledge at our disposal.

This reasoning is worth imbibing because the transfer of knowledge without knowledge transfer across different cultural settings is not fruitful. This assertion is supported by Mkwanazi et al. [3], who argue that the exclusion of cultural practices in CC mitigation strategies continues to prevail. The above-captioned submission argues that the non-partisan acceptance of incorporating cultural practices in CC guidelines can yield enduring and informative insights. A greater understanding of the benefits of including IK in modern practices must be embraced if the most significant threat facing humankind benefits from the cooperative assimilation of adaptive CC strategies. These benefits are verifiably established by scholars that include Mkwanazi et al. [3] and Frantzeskaki et al. [2] and it is undeniable that it creates space for knowledge to be passed from generation to generation through a wide range of activities that sustain a society during CC.

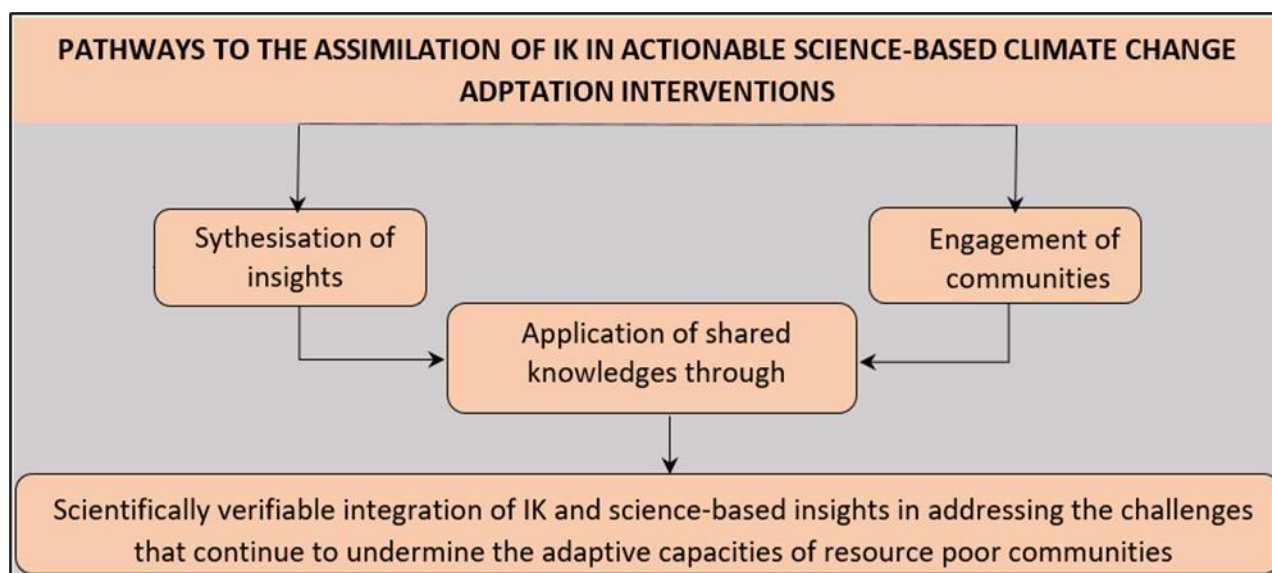
### 5.4. *Promote a Sense of Ownership and Trust*

There is a lack of participation by indigenous people in developing CC mitigation strategies and evidence of suboptimal results in SK's inclusion in CC mitigation strategies. However, empirically informed observations on the role of IK in CC mitigations strongly suggest that it has a vital role in advancing this dispensation. Figure 2 provides an illustrative representation of the co-developed initiatives by community members in this study area.

The framework reaffirms that IK is a significant resource that could be adapted, integrated and used in CC mitigation. To realise the benefits of IK's translation into actionable CC strategies, the framework provided in this paper proposes the following stages, in which researchers and indigenous communities must fully participate in: (a) the synthesis of insights; (b) the engagement of communities; (c) the application of shared knowledge; and (d) the responsible stewardship of resources at our disposal for the benefits of the present and future generations (Figure 2). It begins by encouraging the scientific community to collectively identify the current and potential risks that continue to undermine the livelihoods of resource-poor communities. We urge the scientific community to trial hybrid approaches informed by multidisciplinary investigative approaches because pessimistic narratives of doom are not helpful. The time to act is now and not tomorrow, for tomorrow may never come without the proactive implementation of actionable CC adaptation strategies [36]. This reasoning is premised on researchers being societally obliged to provide informative insights that can be assimilated into implementable CC adaptation strategies. This is because the knowledge-sharing culture between scientists and indigenous communities can deliver immense benefits that will go a long way in enhancing our abilities



to realise the sustainable MDGs of zero poverty, unemployment, and securitised access to the world's reduced access to basic requirements. The final phase involves monitoring and evaluation. These two distinct elements are geared toward assessing whether there is progress toward achieving the essential objectives. Where a CC guideline is less practical or produces suboptimal results, the guidelines would be revised, and sustained if generating the desired results. In other words, for an effective CCAS, all of the key stakeholders must actively participate in designing any CC guideline.



**Figure 2.** Pathways to up-scaling the adoption of actionable IK in CC adaptation strategies.

## 6. Conclusions and Recommendations

This research paper's main objective was to better understand how to address climate change risks and translate our knowledge into actionable CC adaptation strategies. This study's findings argue that IK has immense potential to advance the assimilation and implementation of climate-friendly resource-use practices. We invite those interested in the responsible and sustainable stewardship of the resources at our disposal to contribute to this initiative by: (1) providing objectively informed insights on how we can enhance the meaningful realisation of a habitable planet; and (2) offering insights on how these challenges can be addressed.

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**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study. Written consent was not necessary because this was not a clinical study in which respondents were subjected to experimental observation as patients.

**Conflicts of Interest:** The authors declare no conflict of interest.

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