e-Bangi Faculty of Social Sciences and Humanities Universiti Kebangsaan Malaysia
Journal of Social Sciences and Humanities

eISSN: 1823-884x

Volume 22, Issue 2, DOI: https://doi.org/10.17576/ebangi.2025.2202.52

Article

Language, Knowledge and Resilience: Climate Change Adaptation Efforts among The San in Tsholotsho, Zimbabwe

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Received: 01 January 2025
Accepted: 02 May 2025

Abstract: The San peoples of Southern Africa among the world's oldest continuous cultures—are facing increasing vulnerability due to the impacts of climate change, including shifts in rainfall patterns, biodiversity loss, and land degradation. As traditionally nomadic hunter-gatherers, their adaptive knowledge systems are deeply intertwined with their languages, cultural practices, and environmental understanding. However, socio-political marginalization and language erosion threaten their ability to respond effectively to these challenges. This study explores how the Zimbabwean San in Tsholotsho use their Tshwao language and indigenous knowledge to navigate the impacts of climate change. It examines how these cultural resources, rooted in century-old traditions, inform adaptation efforts in the face of unpredictable weather patterns and other climate stressors. We draw on fieldwork and ethnographic interviews to highlight the role of oral traditions, local ecological knowledge, and unique linguistic expressions tied to the environment in shaping adaptive practices. The San community possesses a rich repertoire of adaptive strategies communicated through their indigenous language, such as detailed knowledge of plant species, animal behaviours and weather patterns that guide resource management and coping mechanisms. These include practices and communal decision-making processes that emphasise sustainability and cooperation. The study further reveals how traditional knowledge faces challenges from external pressures, including the erosion of language skills among younger generations, the impact of modernity and limited access to climate adaptation education in their indigenous language. We thus emphasise integrating indigenous languages into climate adaptation frameworks to enhance the effectiveness of resilience strategies and the preservation of indigenous knowledge for posterity.

Keywords: Adaptation communication; climate change; ecolinguistics; indigenous languages; resilience; traditional knowledge; Tshwao.

Introduction

Climate change, a global phenomenon driven by anthropogenic activities such as deforestation and burning fossil fuels, has led to dramatic shifts in weather patterns worldwide (Mavuso et al, 2022). These shifts are punctuated by variations in precipitation leading to severe and intense droughts (IPCC, 2014; UNEP, 2019). This has posed significant challenges to numerous marginalised communities which are heavily dependent on natural resources for their subsistence. Among these vulnerable groups are the San people of Southern Africa

who face heightened risks of food insecurity, poverty and displacement due to their reliance on climate-sensitive natural resources (Mfitumukiza et al., 2020). These challenges underscore the necessity for effective adaptation strategies which are crucial in mitigating the impacts of climate change on the San and other similar communities. The San people, often referred to as "Bushmen," are recognised as the earliest inhabitants of Southern Africa, with a history dating back over 20,000 years (Hitchcock et al., 2016; Phiri et al., 2020a). In Zimbabwe, they are locally known as 'Abathwa' or 'Amasili' in Ndebele and 'Bakhwa' in Kalanga (Phiri et al., 2020a). However, the San identify themselves as the 'Tshwa' (Huebschle, 2017) or Tshwao (Maseko, et al., 2017), terms that also denote their language. Traditionally, the San were hunter-gatherers although presently, many have transitioned to subsistence farming which is becoming increasingly vulnerable to climate change (Dube et al. 2021). The San people's dependence on forests and climate-sensitive resources exposes them to significant risks, exacerbating issues such as food insecurity and economic marginalisation (Peters et al., 2017). Adaptation is therefore crucial for their survival as the impact of climate change intensifies.

San communities in Southern Africa experience significant vulnerabilities due to the combined effects of climate change and linguistic marginalisation. Indigenous knowledge transmitted through Tshwao constitutes a vital resource for climate adaptation. To enhance the adaptive capacity of San communities, it is essential to recognise and support the role of their language in the transmission of indigenous knowledge, ensuring that these cultural resources are preserved and utilised to mitigate the effects of climate change. While there is abundant literature on climate change particularly in the fields of geography, biology and environmental science (Ruijie & Wei, 2021), there is a dearth of research that spotlights the contributions of language in climate change mitigation (Maseko & Siziba, 2024; Ruijie & Wei, 2021). To address this gap, this study sought to answer the following research questions:

i. How is climate change perceived within the context of the San community's unique social, cultural and ecological landscape?
ii. How does the use of the Tshwao language among the San community of Tsholotsho influence their climate change adaptation strategies?
iii. To what extent do external organisations engage with the local language of the San communities in Tsholotsho and how does this influence the effectiveness of climate change adaptation strategies?

Literature Review

Effective climate change adaptation calls for efficient communication, particularly in marginalised communities where access to formal climate information is often limited (McGahey & Lumosi, 2018; Mavuso et al, 2022). Central to this communication process is the utilisation of indigenous languages, which play a critical role in transmitting indigenous knowledge necessary for adapting to environmental changes (Mawere, 2015). In the case of the San, traditional knowledge transmitted through generations offers valuable insights into climate patterns, resource management and coping strategies. This knowledge is deeply intertwined with their language (Filho et al., 2022). However, the transmission of this knowledge has been severely impacted by the historical processes of linguistic and cultural assimilation. Historically, San communities have faced systemic social, economic, political and linguistic marginalisation and disenfranchisement. The colonial era sought to suppress indigenous languages, particularly Tshwao, which remains critically endangered in Zimbabwe (Guissemo, 2018; Maseko et al., 2017). The San were displaced and exploited with their language and culture increasingly overshadowed by the dominant Ndebele and Kalanga communities leading to language shift (Chebanne & Dlali, 2019). This has occasioned significant losses of cultural identity and traditional knowledge, as Tshwao is intrinsically tied to San's relationship with the natural environment (Mufune, 2010). In Tsholotsho, this language has been subordinated by the more widely spoken Ndebele and Kalanga languages, leading to further erosion of cultural heritage and indigenous knowledge (Maseko et al., 2017).

San marginalisation has profound implications for climate change adaptation (Dube et al., 2021). Indigenous knowledge systems, transmitted through generations in local languages, encompass critical information regarding environmental changes, weather patterns, and survival techniques (Nyong et al., 2007; Naes, 2013). However, the attrition of language skills among younger generations due to the predominance

of Ndebele and Kalanga compromises the transmission of this knowledge (Maseko et al., 2017). This linguistic barrier impedes the San's ability to effectively communicate and implement climate adaptation strategies, as they are excluded from broader climate discussions and initiatives (McGahey & Lumosi, 2018). The global recognition of indigenous knowledge in climate adaptation is emphasised in the 2015 Paris Agreement and by the IPCC (2022). These documents underscore the importance of integrating traditional knowledge with scientific approaches to enhance climate resilience (UNFCCC, 2015). However, this recognition is insufficient if local languages are not actively preserved, promoted and ultimately used in climate change education and communication. This will also foster the revitalisation of Tshwao and its integration into climate communication efforts. In Tsholotsho, the challenge lies in creating spaces in which both indigenous knowledge and scientific information can be disseminated in ways that empower San communities and enable them to adapt more effectively (Dube et al., 2021).

This study undergirded by the ecolinguistic theory and the adaptation framework to explore the role of language in climate change and environmental stewardship. Ecolinguistics is a relatively new and interdisciplinary theoretical approach that has begun to gain traction among climate change and environmental scholars. Its emergence coincided with the 'ecological turn' to emphasise the place and role of language in addressing the ecological crisis (Chen, 2016; Cheng, 2022; Rahardi, 2023). The premise of ecolinguistics regards "the survival of life on earth and key philosophical questions hitherto underacknowledged by mainstream science"(Ponton, 2023, p. 797). This framework draws heavily on Haugen's language ecology model (Haugen, 1972) and Halliday's eco-discursive approach (Halliday, 1990; Halliday and Matthiessen, 2014) to explain the interaction between humans, language and the natural world (LeVasseur, 2015). Resultantly, the terms 'ecology of language' and 'language ecology' permeate all ecolinguistic approaches (Jocuns, 2019). Along Haugen's (1972) conceptualisation, ecolinguistics recognises language as being part of a larger environment which comprises an ecological system made up of languages spoken in a society and how they interact within the speakers' minds (LeVasseur, 2015). Together, these languages form "part of a larger ecology of individual-society-social forces-natural environment, all of which mutually interact with, and shape one another at multiple scales"(LeVasseur, 2015: 22). The ecolinguistics approach is fashioned around an ecosophy of "diversity and harmony, interaction and co-existence"(Cheng, 2022: 189). An 'ecosophy' is a philosophy of ecological harmony that reveals society's orientations towards its environment (Cheng, 2022). In this light, particular ways of using language potentially reveal attitudes towards environmental conservation and sustainability. An ecosophy is thus related to value judgements that facilitate an exposition of ecological orientations as either "eco-beneficial, eco-destructive or eco-ambivalent"(Cheng, 2022, p. 30).

In this study, the ecolinguistics framework therefore provides a valuable lens for understanding how language influences perceptions about the environment and shapes communication strategies in addressing ecological challenges (Nuh & Prawira, 2023; Yasmin & Amin, 2024). Previously, this approach has been deployed to explain how climate change narratives in social media, news and other forms of discourse shape public understanding. For instance, Yasmin & Amin (2024) analysed the use of ecolinguistic techniques on Twitter to highlight women's vulnerability to climate change, while Nuh & Prawira (2023) applied Stibbe's framework to explore environmental narratives in news articles. Ecolinguistics emphasises that language not only reflects but also actively influences ecological awareness and behaviours. This is demonstrated by Rahmawati & Widayati (2021) who explore the role of language shift in promoting environmental practices. Ecolinguistics intersects with other theoretical approaches such as media ecology, as seen in Materynska's (2022) study of environmental coverage in German media. This interdisciplinary approach uncovers how linguistic devices such as anthropomorphic metaphors can shape public perceptions and foster environmental consciousness. The broad application of the theory, from social media analysis to local ecological wisdom, underscores its role in enhancing our understanding of climate change communication and engagement. For our purposes, the ecolinguistic perspective also helps challenge enduring narratives that often promote global languages such as English as the legitimate language of climate change communication and mitigation (Maseko & Siziba, 2024.). To this end, it is useful to demystify the projection of English as the 'green language' (Jocuns, 2019) by spotlighting the importance of the Tshwao language in environmental

sustainability and stewardship among the Zimbabwean San in Tsholotsho. By drawing on observations from previous works, this framework is also productive in revealing how African indigenous languages are inherently imbued with eco-beneficial characteristics and properties (Makaudze, 2021; Makaudze and Shoko, 2015). The foregoing thus suggests that all languages are equally important in climate change communication and mitigation, insofar as they offer unique insights and perspectives about speakers and their relationship with the environment (Maseko & Siziba, 2024).

The adaptation framework complements the ecolinguistics framework by focusing on strategies to reduce vulnerability and increase resilience to climate change. As climate change is inevitable, societies must adapt to new environmental realities (Balaban & Balaban, 2015). According to Ponton (2023), failure by the current generation to mitigate and curtail the course of climate change could result in an irreversible environmental catastrophe and a loss of both terrestrial and marine species. Accordingly, environmental education and awareness have increasingly become important aspects of climate change mitigating initiatives (Corner & Randall, 2011; Maseko & Siziba, 2024). Similarly, the adaptation framework emphasises multilevel governance and highlights the role of local, regional, and global actors in climate adaptation (Xu et al., 2023). It also recognizes the importance of cultural and social factors in shaping perceptions of climate risk (Mcneeley & Lazrus, 2014). This framework assumes that climate change impacts are already occurring and will continue if not abated (Xu et al, 2023; Nyathi, 2024). It encourages societies to prepare for and adapt to these changes rather than solely emphasising prevention. The framework helps identify and address the vulnerabilities of individuals, communities, and ecosystems to climate-related risks such as extreme weather events, sea-level rise, and changing agricultural conditions. However, global responses tend to prioritize mitigation over adaptation, revealing a gap in current climate policies (Cobbinah & N-Yanbini, 2019). This adaptation framework has been applied in various contexts, including policy implementation in cities (Balaban & Balaban, 2015) and regional adaptation strategies (Xu et al., 2023), thus foregrounding the need for more balanced and effective approaches to climate change.

Methodology

This study was conducted in Tsholotsho District, formerly known as 'Tjolotjo'—a name derived from 'Tsorotso'—in Matabeleland North Province, Zimbabwe. In the Tshwao language, "Tsholotsho" translates to "the head of an elephant" (Ndlovu et al., 2022). The district is located in farming region 4 and receives low annual rainfall, averaging 400 mm, which presents a significant threat to food security (Phiri et al., 2020). Tsholotsho has a population of 115,782 across 22 wards (Zimbabwe National Statistics Agency, 2022), with the San community numbering approximately 1,500 individuals, predominantly residing in wards 2, 7, 8, and 10. Wards 7 and 10 were specifically selected for the study due to their unique representation of San livelihoods and climate change adaptation strategies. A qualitative case study approach was adopted to examine the role of language in the San community's climate adaptation efforts. Data collection methods included 30 in-depth interviews, eight key informant interviews, two focus group discussions, and direct observations. Purposive sampling was employed to select participants with rich, relevant knowledge and lived experience in climate adaptation and indigenous language use. These included local leaders, elders, traditional healers, and community activists, who offered in-depth insights into how language functions not only as a means of communication but also as a vessel for cultural knowledge and environmental understanding.

Focus group discussions were conducted with a diverse group of community members—men, women, and youth—to gather a broad spectrum of perspectives on how traditional ecological knowledge is transmitted through language. The discussions explored the ways in which language helps shape the San community's response to climate change and how external interventions might be enhanced or hindered by language dynamics. Observations further enriched the data by documenting everyday language use in practices related to agriculture, water management, and healthcare. These observations provided insight into how language reflects and influences evolving adaptation strategies and how government and NGO programmes interact with and shape local language use. The study examined the implications of language for the success and sustainability of climate interventions. Although the study did not require formal ethical clearance due to its low-risk nature, it was reviewed and approved by the Department of Development Studies at Lupane State

University. Ethical guidelines from the Declaration of Helsinki were strictly followed. Verbal informed consent was obtained from all participants after explaining the study's purpose, procedures, potential impacts, and their right to withdraw at any time. This ensured that ethical standards and respect for participant autonomy were upheld throughout the research process.

The Findings

1. Perceptions Of The San Communities On Climate Change

One of the research questions aimed to establish how the Tsholotsho San community perceive climate change and its variability. It is evident from the findings that the San Communities are cognisant of the changes in climate, and their perceptions are embedded within the context of their unique social, cultural, and ecological landscapes in a manner that is deeply interconnected with their traditional knowledge systems, way of life, and their close relationship with the environment. Specifically, their perceptions of climate change reflected a synthesis of traditional ecological wisdom and contemporary environmental challenges. In one focus group discussion, a participant stated:

> *Climate change is not merely a scientific phenomenon, but a disruption of a harmonious relationship with the land. Climate shifts that affect rainfall, animal migration, and plant growth directly impact our subsistence such as hunting, gathering, and medicinal plant use.*

It is apparent from anecdotal evidence that the San view environmental changes, such as increased incidence of drought, unpredictable rainfall patterns and the diminishing of water sources as indicators of disruption in the natural order. These changes threaten food security as they disrupt their traditional food gathering patterns which constitute the core of their livelihoods. Most of the San's traditional practices are tied to specific ecological conditions such as hunting and tracking animals. By altering ecosystems, climate change has impeded their ability to engage in these activities. This undermines cultural continuity because younger generations are not able to acquire traditional skills since the environment can no longer sustain these practices. Climate change exacerbates the challenges faced by San communities, including displacement from ancestral lands due to droughts, land degradation and competition for resources. This displacement further marginalises these communities, relegating them to less fertile areas and disrupting their traditional social structures. One participant stated the following:

> *Climate change is impoverishing people. It should be noted that we lost land to the colonial administration, and no one has attempted to restore our land. Hwange National Park is a part of our ancestral land. Here comes climate change, droughts, and heat waves. The Kalanga and Ndebele livelihood systems that we have been compelled to adopt are not sustainable. Crop production in this area is also challenging. Animal husbandry is also problematic due to perennial droughts and predatory animals, such as hyenas and jackals.*

For many San communities, the environment and climate are deeply intertwined with their spiritual beliefs. Climate shifts are perceived as part of a broader spiritual imbalance or retribution. Therefore, addressing these changes should involve both spiritual practices and practical solutions. The worldview of the San communities often perceives humans as stewards of the land. As such, ecological and environmental degradation is interpreted as a reflection of human actions that are incongruous with nature. In one in-depth interview, a participant stated the following:

> *Climate change is a manifestation of God's anger toward us. We have transitioned from a hunter-gatherer lifestyle to an agricultural one. Many traditional practices that we previously employed to appease God are no longer observed. The majority of people have converted to Christianity, and our rituals are now denigrated and perceived as malevolent. Given these circumstances, how can we expect to continue receiving adequate rainfall? Elevated temperatures are a form of divine punishment.*

2. The Influence Of Local Language On Climate Change Adaptation Amongst The San Communities

One of the primary research questions aimed to explore the influence of Tshwao on climate change adaptation. The objective of this research was to investigate how language not only shapes their worldview in the context of climate change but also their adaptation efforts. The participants indicated that their language was a source of life and wisdom. It emerged from the engagements that the use of the Tshwao by the San community in Tsholotsho played a crucial role in shaping their climate change adaptation strategies. Language is not only a tool for communication but also a repository of knowledge, culture, and worldviews, which are key elements in how communities perceive and respond to environmental changes (Maseko and Siziba, 2024). For the study participants, language facilitated the transmission of traditional ecological knowledge, social cohesion and resilience-building practices that were integral to their climate adaptation strategies. This was aptly captured by a key informant who stated the following:

> *As San communities, we firmly believe that our language is not only a source of heritage but also a pillar of our way of life. If one examines the Tshwao language, one will find that it is rich in proverbs that encourage environmental protection and the need to live in harmony with nature. The language contains deep knowledge of ecological information that governs individuals as they utilise nature for self-sustenance. In my view, our language is essential in all of our efforts to adapt to climate change and variability.*

The aforementioned anecdotes were corroborated by one participant in a focus group discussion who indicated that:

> *Tshwao embodies a comprehensive grasp of the natural world, including the complex relationships between particular plants, animals, and weather patterns. For instance, specific terms may describe the behaviour of certain animals before a drought or the medicinal properties of plants that can be employed during times of resource limitation. If this linguistic method of knowledge transfer were to cease, the San people could lose vital information essential for coping with climate-related difficulties.*

It also emerged from engagements that the preservation of cultural identity among the San people was significantly influenced by their language. During times of climatic stress, cultural practices, often conveyed through linguistic means strengthen community bonds and encourage collective action. Shared stories, melodies and ceremonies, such as those performed during rainfall or crop gatherings offer emotional and mental support, thereby bolstering the San community's ability to withstand climate-related adversities. In this manner, language serves not only as a survival mechanism but also as a means of cultivating unity within the community in the face of external pressures, including those stemming from climate change.

Participants also indicated that their traditional belief system was closely tied to their language and perceptions of the environment. For most participants, language serves as a conduit through which spiritual practices are maintained, including rituals to ensure adequate rains or blessings for abundant harvest. These spiritual practices often function as a means of coping with the uncertainty of climate change, thereby assisting to maintain the community's sense of control and hope. One participant, who is a spirit medium stated:

> *Everything in this community resonates with language. Rainmaking ceremonies are effective only when we communicate with our ancestors using our language. God also understands us when we employ our language. Our Tshwao language is our source of efficacy for addressing our concerns.*

The above notwithstanding, it was noted that the lack of effective intergenerational transmission of the Tshwao language posed a significant challenge towards climate change mitigation. Since language shift to Ndebele and Kalanga by the younger generation also implies cultural shift, this occasions the erosion of indigenous knowledge about the environment that is encoded in the Tshwao language. This is further exacerbated by the marginality of Tshwao in climate change communication and mitigating programmes by government and Non-Governmental Organisations (NGOs). To this end, the spirit medium further retorted:

One significant challenge is with young individuals who are not interested in utilising their native language. The situation is exacerbated by the lack of a language policy to protect us. In most meetings, training and gatherings, especially with the government and NGOs our language is rarely utilised.

Most participants also concurred that their indigenous languages facilitated the exchange of knowledge and ideas within the community. In climate change adaptation, decision-making often occurs in collective settings where elders and other community members discuss strategies for managing natural resources, conserving water, or addressing food scarcity. Language is crucial for a participatory approach to adaptation, as it enables the sharing of experiences and solutions based on local knowledge.

3. External organisations and use of local languages in adaptation efforts

We also attempted to assess the extent to which Non-State Actors and Government Departments involved in climate change adaptation and resilience initiatives utilised the Tshwao language to enhance the success of their programmes. Study participants indicated that external organisations' engagement with the local language of San communities was a critical factor in the effectiveness of climate change adaptation strategies. It emerged from the discussions that the extent to which these organisations incorporate or respect the San's indigenous language can significantly affect how well adaptation measures resonate with the local community and whether they are successfully implemented. A key respondent stated:

The current government seeks to ensure that no one is left behind in terms of development. To me, this is important but can only be achieved if our Tshwao language is used by all non-governmental organisations and also by the government departments who come to educate us about climate change. Unfortunately, t we have observed that in this part of Tsholotsho, government extension workers tend to undermine our language. How do you expect us to support, for example, smart farming when people just come to us and start using Ndebele, Kalanga, and in some cases Shona? This disrespects our heritage.

The deliberations on external organisations and the use of local language evoked strong reactions among the participants. Some perceived that organisations were deliberately marginalising their language. This was captured by one female participant who retorted:

Community development initiatives, including those that seek to assist in dealing with climate change impacts, are failing in this community. The narrative that has persisted for a long time is that the San people resist development and transition because they want to remain primitive. It is a lie. When external organisations engage us, incorporating the local language is a way of demonstrating respect for cultural and linguistic heritage. This approach can help to bridge the gap between external interventions and local knowledge systems. Language is closely tied to how we understand and interpret our environment; therefore, engaging with us in our own language allows organisations to better understand local perceptions of climate change and more accurately assess our community needs.

However, it also emerged from one focus group discussion that a few late-stage organisations are attempting to utilise local informants to address the language barrier. One participant remarked thus:

Of all the organisations, Plan International and Tso-ro-otso demonstrate a willingness to collaborate with us. They respect our language and cultural values. Agritex extension workers exhibited the poorest performance. I prefer not to discuss them further. Their performance was highly unsatisfactory, which explains why individuals frequently boycott their initiatives in this area.

Thus far, the study findings reveal that climate change adaptation strategies require clear communication about risks, solutions, and behavioural changes. When organisations employ a local language, messages about climate change, such as the importance of water conservation or shifts in agricultural practices can be conveyed in ways that are culturally relevant and readily comprehensible and relatable. Misunderstandings may arise when climate terminology is introduced into a foreign language that lacks

equivalent terms in the local language. Deliberations with participants also indicated that engaging in a local language assists external organisations in building trust within San communities. When organisations respect and utilise the San language, it fosters a sense of inclusion and recognition. This is particularly significant given the historical marginalisation of the San people. Trust is critical for the success of any adaptation strategy, as communities are more likely to engage in programmes that respect their identities and values. In one in-depth interview, the participant pointed out that:

> *External organisations that engage with us often train local facilitators who speak the community's language. This approach is beneficial as it empowers local leaders and enables them to communicate information in culturally appropriate ways. By ensuring that local facilitators are involved, external organisations ensure that climate adaptation strategies are not only communicated effectively but also tailored to the community's linguistic and cultural context.*

Discussion

The San community of Southern Africa possesses a profound and intricate body of adaptive knowledge that is intimately tied to their indigenous language, particularly Tshwao. This knowledge includes detailed understandings of the natural environment—encompassing plant species, animal behaviours, weather patterns, and resource management strategies—that have enabled the San to live sustainably in arid and ecologically sensitive regions for generations. These practices, deeply rooted in collective decision-making and transmitted through oral tradition, reflect a community-oriented ethos emphasizing environmental stewardship and social cohesion. The study aligns with broader scholarly findings on the significance of indigenous knowledge in climate change adaptation. Research across the globe confirms that Indigenous communities often observe and interpret environmental change through lived experiences and intergenerational knowledge. For instance, in the western Himalayas, over 95% of indigenous respondents acknowledged climate change based on first hand environmental shifts (Negi et al., 2021). Similarly, a comparative study in Bangladesh involving the Khasia and Tripura communities highlighted divergent perceptions of climate change causes and impacts, illustrating that local environmental understandings are shaped by distinct cultural, geographic, and socio-demographic factors (Ahmed & Haq, 2017). These findings underscore that Indigenous responses to climate change are deeply contextual and that each community—including the San—holds unique insights into environmental transformations.

Among the San, environmental awareness is expressed through the Tshwao language, which conveys an eco-centric worldview grounded in respect, reciprocity, and co-existence with nature. This worldview, or "eco-beneficial ecosophy," discourages exploitative practices and promotes behaviors that are environmentally restorative and community-sustaining. Language serves as both a vehicle and a vessel for this ecological wisdom, encoding practices and ethical principles that guide human-nature interactions. Recognizing and understanding these perspectives is critical for designing effective, culturally relevant climate adaptation strategies that are accepted and internalized by Indigenous communities (Nyahunda, 2019; Ahmed & Haq, 2017). Traditional ecological knowledge systems are primarily oral and culturally embedded, and their survival depends heavily on the vitality of the languages in which they are expressed. Scholars widely agree that Indigenous knowledge plays a vital role in climate resilience, particularly in rural and marginalized areas where formal environmental governance may be limited or absent (Kansuntisukmongkol, 2016; Hosen et al., 2019; Israel & Sierra, 2023). However, despite being constitutionally recognized as one of Zimbabwe's 16 official languages since 2013, Tshwao remains severely marginalized. In regions like Tsholotsho, where languages such as Ndebele and Kalanga dominate, Tshwao is sidelined, leading to a gradual language shift and loss of ecological knowledge. Efforts by organizations such as the Tsoro-o-tso San Development Trust to promote Tshwao have made some impact, but much more is needed to encourage its use among younger generations and safeguard its role in environmental sustainability.

The broader landscape of climate change adaptation in Africa has often overlooked the contributions of Indigenous knowledge systems. Many external development agencies fail to meaningfully integrate local languages, practices, and governance structures into their programming. Research indicates that incorporating indigenous languages and institutions can improve the uptake and effectiveness of climate-smart innovations

by enhancing communication, building trust, and strengthening community ownership of initiatives (Pearson et al., 2020; Makate, 2019). However, challenges persist in practice. In sub-Saharan Africa, for example, policies supporting mother-tongue education exist, but implementation is rare due to complex stakeholder dynamics and entrenched biases about language use in formal education (Trudell, 2007). On a global level, international organizations such as the UNFCCC, the Green Climate Fund, and the International Work Group for Indigenous Affairs have recognized the critical role of Indigenous Peoples in climate policy and forest governance.

Yet, to truly empower these communities, adaptation governance frameworks must be restructured to place Indigenous knowledge at the center of decision-making, rather than treating it as supplementary or symbolic (Chanza et al., 2022). The marginalization of Tshwao in climate education and policy discourse limits the San community's ability to contribute effectively to environmental decision-making. Scholars argue that side-lining indigenous languages in climate communication frames climate action as elitist and disconnected from local realities (Maseko & Siziba, 2024). Conversely, initiatives that prioritize linguistic inclusion promote environmental practices that are more sustainable and widely accepted. Indigenous languages, as repositories of ecological wisdom, naturally align with principles of conservation, responsibility, and interdependence (Makaudze, 2021; Cheng, 2022). Ultimately, valuing and promoting linguistic diversity is essential for fostering inclusive and sustainable environmental governance. Recognizing the San's language and knowledge systems not only enhances climate resilience but also affirms their rights, identity, and cultural continuity. As climate challenges intensify, efforts to preserve and integrate Indigenous languages like Tshwao are not just acts of cultural preservation—they are strategic, forward-thinking responses to the global climate crisis.

Conclusion

This study aimed to evaluate the efficacy of linguistic resources employed in climate change discussions within the San communities of Tsholotsho. It examined how their indigenous Tshwao language can enhance public participation in climate change mitigation and adaptation by the San community. Empirical findings suggest that climate change initiatives have tended to prioritise message creation without considering linguistic implications, resulting in misconceptions and ambiguities surrounding climate change education and communication. This study contends that employing the local Tshwao language is essential for effective climate change mitigation and adaptation. The results revealed a discrepancy between the language used in climate change discourse and its practical application in local communities, thus hindering successful adaptation. The San people in Tsholotsho and Zimbabwe encounter significant obstacles in adjusting to climate change, as shifting weather patterns, droughts, and floods jeopardise their conventional livelihoods, food security, and social fabric.

Nevertheless, their resilience stems not from passive endurance alone but from the active utilisation of Traditional Ecological Knowledge (TEK), cultural practices, and their close connection with the environment. In this context, language serves a vital function, not merely as a communication tool but also as a medium for conserving and conveying this knowledge across generations. Their Tshwao language serves as a repository of ecological knowledge, enabling them to understand and adapt to environmental changes. This linguistic heritage, transmitted orally across generations, is crucial for detecting and addressing changes in nature, including alterations in climate patterns, water resources and seasonal fluctuations. In this context, language is inextricably linked to resilience, allowing the community to sustain their connections to the environment and their cultural heritage. However, the San's capacity to cope with climate change faces increasing challenges due to social and linguistic exclusion, economic marginalisation, and the decline of traditional knowledge, particularly as younger San individuals are increasingly exposed to urban environments and mainstream educational systems. Climate change adaptation strategies that fail to consider the linguistic, cultural, and ecological framework of the San may prove ineffective or inadvertently undermine resilience. The convergence of linguistic heritage, traditional knowledge, and adaptability demonstrates that the San people's endurance amid climate change extends beyond the mere adoption of novel technologies or developmental initiatives. It hinges on acknowledging and nurturing cultural and ecological practices that

have sustained communities for millennia. The erosion of their language and long-established ecological insights would not only disconnect the San from their heritage but also diminish their ability to cope with future challenges. Therefore, this study makes a significant contribution to the emerging literature that spotlights the taken-for-granted importance of language, indigenous knowledge and culture in climate action, climate change mitigation and resilience building within indigenous communities.

To effectively support climate change adaptation in San communities in Tsholotsho, a holistic strategy must empower the San to integrate both ancestral knowledge and modern resources. This approach should respect their cultural values, linguistic traditions, and social systems, while enhancing access to contemporary technologies and information. The study highlights the importance of context-specific language use in climate discourse and calls for the revitalization of native languages, particularly among the youth, who are increasingly disengaged from their linguistic heritage. This generational language shift poses a significant threat to the transmission of traditional ecological knowledge and community resilience. Future research should explore the links between language preservation, youth engagement, and climate resilience. Understanding how younger San perceive climate change and how they view the role of indigenous language in environmental sustainability could inform more effective adaptation strategies. Additionally, identifying methods to foster youth pride in their linguistic and cultural identity could strengthen their participation in climate initiatives. The erosion of cultural identity through language attrition may diminish the San's capacity to respond to environmental challenges. Given the close connection between language, worldview, and ecological understanding, preserving the Tshwao language is essential for sustaining cultural continuity and adaptive capacity in the face of climate change.

***Acknowledgement*:** The authors express their gratitude to the members of the San community and key informants from governmental and non-governmental entities who participated in the study.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors reported no potential conflict of interest

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