

## **The Impact of Indigenous Knowledge on River Basin Management in Calabar South LGA, Cross River State, Nigeria**

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### **Abstract**

*This study explores the impact of integrating indigenous knowledge into river basin management policies, focusing on its potential to enhance water resource sustainability and community resilience. Traditional knowledge, accumulated over generations, offers valuable insights into sustainable water practices that are often overlooked in modern management frameworks. This research aims to assess the extent of traditional knowledge within the community, identify the traditional practices employed for water conservation, and analyze the challenges hindering its integration into contemporary policies. Employing a mixed-methods approach, the study combines quantitative surveys and qualitative interviews to gather data from a sample of 384 respondents within the Calabar South Local Government Area. The quantitative analysis involves correlation tests to examine the relationship between indigenous knowledge and water management outcomes. The results reveal that 33.07% of respondents have extensive traditional knowledge about water resource management, while 25.00% report moderate knowledge, 25.00% have limited knowledge, and 16.93% possess no traditional knowledge. Additionally, traditional practices for water conservation include rainwater harvesting (25.52%), aquifer recharge (23.96%), watershed management (26.56%), and traditional irrigation techniques (23.96%). The correlation analysis shows significant positive relationships between the integration of indigenous knowledge and both water resource sustainability ( $r = 0.68$ ) and community resilience ( $r = 0.62$ ). This indicates that incorporating traditional practices can effectively improve water management and strengthen community resilience. However, challenges such as lack of recognition by government authorities (25.52%), insufficient collaboration between stakeholders (23.96%), cultural biases (24.74%), and limited funding (25.78%) hinder the effective integration of indigenous knowledge. The study concludes that integrating indigenous knowledge into river basin management can lead to more sustainable and resilient water management practices. It recommends increasing recognition and funding for traditional practices, fostering collaboration between stakeholders, and addressing cultural biases. By embracing indigenous knowledge, policymakers can enhance the effectiveness of water management strategies and support community well-being.*

**Key words:** Community Resilience, Indigenous Knowledge, River Basin Management, Traditional Practices, Water Resource Sustainability.

### **Background to the study**

Indigenous knowledge is fundamental to the development of river basin management plans around the world. It combines age-old knowledge with new methods to promote sustainable development. Indigenous communities have developed an understanding of river ecosystems through generations of close interaction with them, incorporating ecological, cultural, and social aspects into their management practices. Tribes such as the

Achuar in Ecuador and the Maori in New Zealand, for example, are prime examples of how indigenous knowledge helps maintain biodiversity, maintain water quality, and use sustainable fishing techniques in the Amazon basin (Baldacchino, 2021). Conservation initiatives become more resilient and effective when indigenous viewpoints are included, protecting important ecosystems for coming generations. Beyond ecological preservation, indigenous knowledge also guides responsible tourism practices in well-known locations, such as Tanzania's Serengeti National Park, Australia's Great Barrier Reef, and the Amazon Rainforest, encouraging environmental conservation and respect for local culture (Vrabcová, & Urbancová, 2021).

In many developed nations, traditional wisdom is the foundation for developing creative strategies for managing river basins, fusing traditional knowledge with modern scientific techniques to support environmental initiatives. Governments like the United States, Canada, and Australia highlight the critical role that aboriginal peoples play in protecting water resources and planning all-encompassing river basin management plans. Indigenous Peoples such as the First Nations, Métis, and Inuit in Canada, for example, have deep ecological knowledge that supports sustainable water management techniques, which include habitat restoration programs and freshwater conservation efforts (Suhani, Monika, Vaish, Singh, & Singh, 2020). In a similar vein, Aboriginal communities in Australia possess deep knowledge of river ecosystems and seasonal variations, which is essential for effective water resource management and biodiversity conservation (Acreman, Hughes, Arthington, Tickner, & Dueñas, 2020). However, Native American tribes in the United States, such as the Confederated Tribes of the Umatilla Indian Reservation and the Navajo Nation, use their traditional ecological knowledge to inform efforts to mitigate pollution and restore aquatic habitats, which plays a crucial role in river basin management (Lim, & Do, 2023). By incorporating native viewpoints, these countries strengthen the adaptability and effectiveness of their river basin management plans, guaranteeing the long-term and sustainable use of water resources for present and future generations.

African river basin management strategies are greatly influenced by indigenous knowledge, which provides a synthesis of traditional knowledge and new perspectives to address urgent environmental issues. Local river ecosystems are the source of a wealth of information about water resources that indigenous communities like the Maasai and the Batwa in Kenya, Tanzania, and Uganda possess. These communities have sophisticated knowledge about seasonal variations, indicators of water quality, and sustainable agricultural practices. This indigenous knowledge boosts resilience against the effects of climate change and human activity, and it forms the basis for conservation initiatives and sustainable water management techniques. Water resource management efforts are greatly aided by the Maasai community in Kenya, for example, which actively participates in community-based conservation initiatives to protect riparian zones and regulate grazing practices to reduce soil erosion and water pollution (Akhtar, Syakir Ishak, Bhawani, & Umar, 2021).

River basin management policies that incorporate indigenous knowledge have great potential to benefit African countries by improving water security, supporting the cultural heritage of indigenous peoples, and supporting the health of ecosystems (Zvobgo, Johnston, Williams, Trisos, Simpson, 2022). Governments and other stakeholders can create context-specific strategies that balance the needs of society and the local ecological dynamics by acknowledging and utilizing the insights drawn from indigenous communities. Considering indigenous knowledge systems helps to create inclusive

governance structures that value a range of viewpoints, empower communities, and use resources sustainably. Therefore, African nations can pave the way for comprehensive river basin management that celebrates the priceless contributions of indigenous peoples to environmental stewardship while simultaneously preserving natural ecosystems by embracing the synergies between traditional wisdom and cutting-edge scientific methods (Baulch, 2024).

In areas such as the Cross River Basin, the indigenous population has accumulated a wealth of traditional knowledge that has been transmitted through the generations, providing invaluable perspectives on the sustainable administration of water resources. Integrative approaches to maintaining the integrity of river ecosystems are supported by deeply ingrained indigenous practices within these communities. An example of how cultural heritage and environmental stewardship can work together is seen in the Efik people who live along the Cross River. Their extensive knowledge of medicinal plants is crucial to preserving ecological balance while also providing necessary healthcare resources (Guzman, 2021). The relationship between human activity and river dynamics also provides important lessons for river basin management in places like the Bakassi Peninsula, where indigenous communities flourish. Management choices can be made to prevent degradation and guarantee the long-term sustainability of river basins in Calabar South by understanding the relationships that exist between human activity and environmental results (Abdulyakeen, 2022). Incorporating indigenous knowledge into river basin management strategies benefits regional cultural preservation and community empowerment in addition to improving environmental conservation efforts. Local communities are empowered to take control of their natural resources and actively participate in decision-making processes when indigenous perspectives are valued and taken into consideration.

## **Literature Review**

### ***Traditional knowledge of indigenous communities regarding water resource management***

Traditional knowledge systems of indigenous communities have long played a crucial role in water resource management, encompassing a range of practices and beliefs developed over centuries. Indigenous knowledge includes sophisticated techniques for water conservation, quality monitoring, and seasonal forecasting, often integrated into their cultural practices and rituals (Borthakur, & Singh, 2020). Historical evidence shows that indigenous communities have employed diverse methods such as traditional irrigation systems, rainwater harvesting, and the use of natural indicators to manage water resources sustainably. These practices reflect a deep understanding of local ecosystems and climate patterns, often leading to efficient and sustainable water use (Srivastav, Dhyani, Ranjan, Madhav, & Sillanpää, 2021).

Community practices and methods related to water management highlight the ingenuity of traditional approaches. For example, many indigenous cultures have developed intricate water storage systems using locally available materials, designed to optimize the collection and distribution of water during dry periods (Cassin, & Ochoa-Tocachi, 2021). Additionally, traditional ecological knowledge often incorporates cultural rituals that emphasize the sacredness of water and the need for its conservation, which reinforces community norms around water use (Hosen, Nakamura, & Hamzah, 2020). These practices not only reflect an intimate knowledge of local water systems but also contribute to the resilience of these communities in the face of environmental changes.

Despite their significance, traditional water management practices face challenges when interfacing with modern approaches. Integration of indigenous knowledge with contemporary water management strategies can be hindered by a lack of recognition and understanding from external stakeholders (Adade Williams, Sikutshwa, & Shackleton, 2020). Additionally, pressures such as climate change, industrialization, and land use changes pose threats to the preservation of traditional knowledge. Addressing these challenges requires collaborative efforts that respect and incorporate traditional knowledge while also adapting to modern needs, ensuring that indigenous practices continue to contribute to sustainable water resource management.

***Barriers to integrating indigenous knowledge into river basin management policies***  
Integrating indigenous knowledge into river basin management policies presents several barriers rooted in historical, cultural, and systemic challenges. One significant barrier is the historical marginalization of indigenous communities and their knowledge systems by mainstream scientific and policy frameworks (Masenya, 2022). This historical context often results in a lack of recognition and respect for indigenous knowledge, leading to its exclusion from formal management practices. The disconnect between traditional and scientific approaches to river basin management exacerbates this issue, as indigenous methods are frequently undervalued or misunderstood within the broader policy-making process (Moore, 2021).

Cultural differences also pose substantial barriers to the integration of indigenous knowledge into river basin management policies. Indigenous knowledge systems are often embedded within unique cultural contexts, which can be challenging for non-indigenous policymakers to understand and appreciate (Mazzocchi, 2020). The language and conceptual frameworks used in traditional knowledge may not align with those employed in contemporary management strategies, leading to difficulties in communication and collaboration (Wheeler, & Root-Bernstein, 2020). This cultural disconnect can hinder the effective integration of indigenous practices and perspectives into river basin management frameworks.

Furthermore, systemic and institutional barriers contribute to the difficulties in incorporating indigenous knowledge into river basin management policies. Institutional resistance and rigid bureaucratic structures often limit the flexibility needed to incorporate diverse knowledge systems (Vicuña, Scott, Borgias, Bonelli, & Bustos, 2020). Additionally, the lack of formal mechanisms for recognizing and incorporating indigenous knowledge into policy processes creates obstacles to its integration (Chapman, & Schott, 2020). Addressing these barriers requires efforts to build more inclusive policy frameworks that value and integrate indigenous perspectives, ensuring that river basin management strategies are both effective and equitable.

### ***Social-Ecological Systems (SES) Theory.***

The theory emphasizes the interdependence between social systems and ecological systems and highlights the importance of integrating diverse forms of knowledge to achieve sustainable management practices (Shawoo, & Thornton, 2019). SES Theory provides a framework for understanding how indigenous knowledge contributes to the sustainability of water resources and how it can be integrated with contemporary management policies. It highlights the need for collaboration between indigenous communities and policymakers to create adaptive and resilient management strategies that respect and incorporate traditional practices while addressing modern challenges (Cajete, 2020).

## Materials and Method

Calabar South Local Government Area (LGA) is situated in the southsouthern part of Cross River State, Nigeria, and covers an area of approximately 188.6 square kilometers. It lies between the latitudes of 4°45'N and 5°30'N, respectively, and the longitudes of 8°15'00"E and 8°21'00"E, and has an area of about 164 km<sup>2</sup> and is bounded in the North by Odukpani L.G.A, in the East by the great Kwa River, in the West by the Calabar River and the South by the estuary. As of the 2022 population projection, Calabar South has a population of 291,700, reflecting a significant increase from the 191,515 recorded in the 2006 census. Calabar experiences peak temperatures of roughly 35 °C from January to February, with a yearly average temperature of 27 °C. According to Afangideh, Njar, Ewa, Eli, and Iwara (2011). The city of Calabar is situated on an alluvial fan-shaped sedimentary basin with fluvial deposits that is drained by the Great Kwa and the Calabar Rivers, as well as a web of creeks. The location is on a plain with gentle undulations. A mixed-methods approach is used in the research design to examine the influence of indigenous knowledge on river basin management in Calabar South. This approach combines qualitative and quantitative methodologies to provide a thorough understanding of the phenomenon.



FIG 1: Map of Calabar South Local Government Area

Source: Surveyor General Office, Cross River State, 2024.

## Findings and Discussion

Table 4.1 presents an overview of the community’s traditional knowledge about water resource management. The table categorizes respondents based on their level of traditional knowledge: 33.07% have extensive knowledge, 25.00% possess moderate knowledge, 25.00% have limited knowledge, and 16.93% have no traditional knowledge. This distribution indicates that while a significant portion of the community has a substantial understanding of traditional water management practices, there are also notable gaps, with a segment of the population either having limited knowledge or none at all. The data underscores the varying levels of traditional expertise within the community and highlights the potential need for educational initiatives to enhance understanding of traditional water management practices.

Table 4.2 outlines the traditional practices employed by the community for water conservation. The most frequently reported practice is watershed management, used by 26.56% of respondents, followed by rainwater harvesting and traditional irrigation techniques, each at 25.52% and 23.96% respectively. Aquifer recharge also accounts for 23.96% of responses. These figures illustrate the community’s reliance on various traditional methods to manage and conserve water resources effectively. The table highlights the diversity of traditional practices and suggests that multiple strategies are employed to address water conservation needs, reflecting the community’s adaptive approaches to maintaining water resources.

Figure 1 illustrates the community’s perception of preserving traditional knowledge in water resource management. The data shows that a majority of respondents (35.16%) view the preservation of traditional knowledge as very important, highlighting a strong appreciation for indigenous wisdom in addressing modern water management challenges. However, opinions vary, with some considering it somewhat important (25.52%), not very important (21.61%), or not important at all (17.71%). These varying responses reflect differing attitudes within the community, with some valuing traditional practices for their role in resilience and cultural identity, while others may prioritize contemporary concerns over traditional knowledge. Understanding these perspectives helps stakeholders grasp the community’s values and priorities related to traditional knowledge preservation.

Table 4.3 identifies key challenges hindering the incorporation of indigenous knowledge into broader practices. The table reveals that the most significant challenge is limited funding for integrating indigenous knowledge, reported by 25.78% of respondents. This is closely followed by a lack of recognition by government authorities (25.52%), cultural biases against indigenous knowledge (24.74%), and insufficient collaboration between stakeholders (23.96%). These challenges highlight systemic issues that impede the effective incorporation of traditional practices into mainstream frameworks, underscoring the need for increased funding, recognition, and collaborative efforts to address these barriers and facilitate the integration of indigenous knowledge.

Table 4.1 COMMUNITY’S TRADITIONAL KNOWLEDGE ABOUT WATER RESOURCE MANAGEMENT

Traditional knowledge	Frequency	Percentage
Extensive	127	33.07
Moderate	96	25.00
Limited	126	25.00
None	35	16.93
Total	384	100.00

Source: Authors fieldwork, 2024

Table 4.2 TRADITIONAL PRACTICES EMPLOYED FOR WATER CONSERVATION

Traditional practices	Frequency	Percentage
Rainwater harvesting	98	25.52
Aquifer recharge	92	23.96
Watershed management	102	26.56
Traditional irrigation techniques	92	23.96
Total	384	100.00

Source: Authors fieldwork, 2024

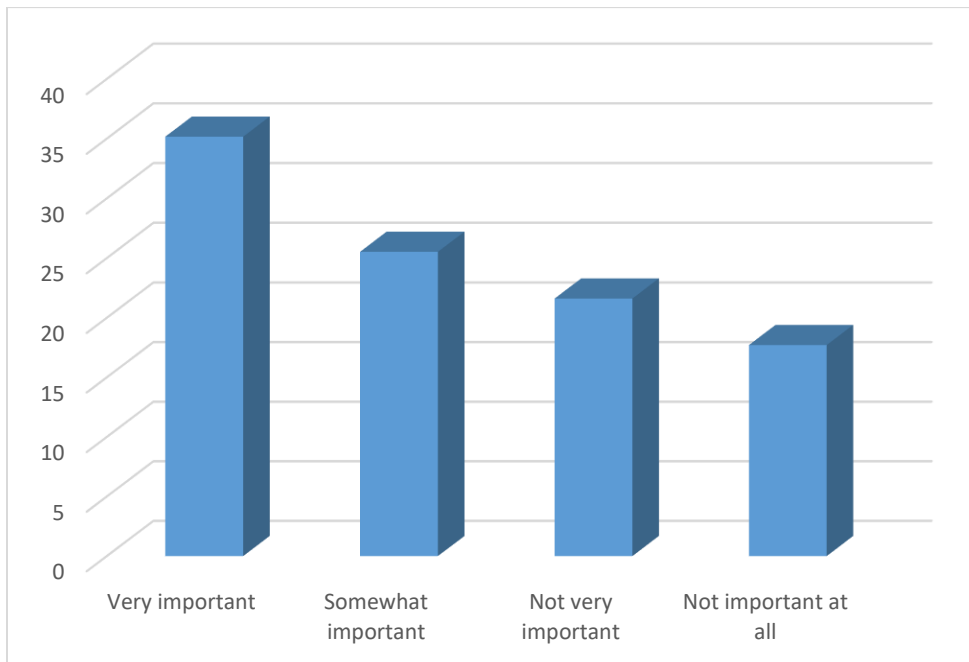


FIGURE 1: Community perception of preserving traditional knowledge

Source: Authors fieldwork, 2024

Table 4.3 CHALLENGES HINDERING THE INCORPORATION OF INDIGENOUS KNOWLEDGE

Challenges	Frequency	Percentage
Lack of recognition by government authorities	98	25.52
Insufficient collaboration between stakeholders	92	23.96
Cultural biases against indigenous knowledge	95	24.74
Limited funding for indigenous knowledge integration	99	25.78
Total	384	100.00

Source: Authors fieldwork, 2024

The correlation analysis table presents the relationships between the integration of indigenous knowledge, water resource sustainability, and community resilience. The Pearson correlation coefficient for the integration of indigenous knowledge and water resource sustainability is 0.68, indicating a strong positive relationship, and is statistically significant with a p-value of 0.000. Similarly, the correlation between the integration of indigenous knowledge and community resilience is 0.62, also showing a significant positive relationship. The strongest correlation is observed between water resource sustainability and community resilience, with a coefficient of 0.74, demonstrating a robust and significant positive association. All correlations are significant at the 0.05 level, suggesting that integrating indigenous knowledge into river basin management is positively associated with improvements in both water sustainability and community resilience.

Table 4.4: PEARSON CORRELATION

Variable	Pearson Correlation	Sig. (2-tailed)	N
Integration of Indigenous Knowledge and Water Resource Sustainability	0.68	0.000	384
Integration of Indigenous Knowledge and Community Resilience	0.62	0.000	384
Water Resource Sustainability and Community Resilience	0.74	0.000	384

### Conclusion and Recommendations

The study demonstrates a significant positive correlation between the integration of indigenous knowledge and both water resource sustainability and community resilience. These findings highlight the importance of recognizing and integrating indigenous knowledge into contemporary management strategies, suggesting that such integration



not only preserves valuable cultural practices but also contributes to more effective and resilient water management solutions. Consequently, policymakers should prioritize collaborative approaches that include indigenous perspectives to address water management challenges and achieve sustainable outcomes.

The findings the analysis indicate a positive relationship between the integration of indigenous knowledge and key outcomes in river basin management. Specifically, the significant correlations observed between indigenous knowledge and both water resource sustainability ( $r = 0.68$ ) and community resilience ( $r = 0.62$ ) underscore the value of traditional practices in enhancing environmental and social outcomes. This suggests that incorporating indigenous knowledge into management policies can effectively contribute to improved water sustainability and strengthen community resilience, aligning with the hypothesis of the study. The strong correlation between water resource sustainability and community resilience ( $r = 0.74$ ) further supports the notion that effective water management not only benefits the environment but also positively impacts community well-being.

These results highlight the importance of integrating traditional knowledge into contemporary river basin management strategies. The significant and positive associations found in this study advocate for greater recognition and incorporation of indigenous practices to address current water management challenges. As such, policymakers and stakeholders should consider fostering collaboration with indigenous communities and valuing their traditional knowledge as a crucial component in developing more resilient and sustainable water management practices. This approach can lead to more holistic and effective management strategies that honor cultural heritage while addressing modern environmental and socio-economic needs.

Establishment of formal partnerships between government agencies, indigenous communities, and other stakeholders to integrate traditional knowledge into river basin management policies. Allocation of dedicated resources and funding to support the documentation, preservation, and application of indigenous water management practices.

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