

LEVERAGING FISHERS TRADITIONAL ECOLOGICAL KNOWLEDGE (TEK) FOR TECHNOLOGICAL DEVELOPMENT IN LAKE CHAD BASIN, NIGERIA, PRIVATE – PUBLIC PARTNERSHIP APPROACH

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This study investigates potentials of Traditional Ecological Knowledge (TEK) in driving technological development in Lake Chad Basin, Nigeria, through Private – Public Partnership Approach, with a focus on water resource management and sustainable fishing practices. Both primary and secondary data were obtained with the application of survey method with the aid of checklist through interview to elicit information from the respondents. The study underscores the critical role of government support and policies in facilitating successful partnerships and promoting technological development. The study emphasizes the need for building trust, improving communication and ensuring transparency in private-public partnerships to harness the penitential of traditional ecological knowledge for sustainable technological development. Recommendations are made for leveraging fisher's traditional ecological knowledge for technological development through a private-public partnership approach in the study area.

Key words: *Fisher's, Private-Public Partnership Approach, Leveraging, Technological Development, Traditional Ecological Knowledge.*

1. INTRODUCTION

Traditional Ecological Knowledge (TEK) unlock innovative solutions for sustainable development. Leveraging traditional ecological knowledge enables communities to develop context specific technologies that promote environmental stewardship and

improve livelihoods. The synergy between traditional ecological knowledge and modern technology drive technological development, enhance resource management, and foster sustainable development. Specifically, traditional ecological knowledge leads to technological development ensuring solutions are tailored to local needs. Combining

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traditional ecological knowledge with modern technology fosters creativity and motivation subsequently promotes environmental stewardship and sustainable management (Berkes, 2012).

Leveraging traditional ecological knowledge leads to innovative solutions for developmental challenges in the Lake Chad Basin region. The Lake Chad Basin, with its rich cultural heritage and diverse ecosystems, presents a unique opportunity for leveraging traditional ecological knowledge to drive technological development and improve livelihoods. Local communities in the Lake Chad Basin possess valuable traditional knowledge that inform and enhance technological interventions in the areas of agriculture, fisheries and water management. Private – public partnerships play a crucial role in harnessing traditional ecological knowledge for technological development in the Lake Chad Basin through bringing together local knowledge, technical expertise and resources. Collaborations between local communities, government agencies and private sectors actors facilitate the development and implementation of innovative technologies build on traditional ecological knowledge in the Lake Chad Basin region (Kuster and Wang, 2013).

Traditional ecological knowledge plays a vital role in informing scientific research and technological development in the Lake Chad Basin, Nigeria. Researchers gain valuable insights in to the complex interactions between fishers' activities and ecosystems through harnessing the indigenous knowledge of local communities. The knowledge leveraged to develop innovative technologies and management strategies promote sustainable fisheries management, conservation of aquatic resources and preservation of fish habitats. Leveraging traditional ecological knowledge for technological development helps in policy formulation to ensure long-term sustainability of natural resources in the Lake Chad Basin, ultimately contributing to the well-being of local communities and the environment (Berkstrom, Papadopoulos, Jiddawi and Nordlund, 2019).

Unfortunately, the Lake Chad Basin Nigeria is confronted with pressing development challenges, notably environmental degradation, poverty and restricted access to cutting edge technologies. Despite the region's rich cultural heritage and diverse ecosystems, the potential of traditional ecological to drive technological innovation and enhance livelihoods remains largely untapped. The inadequate

integration of traditional ecological knowledge with modern technology has impeded the development of innovative solutions to address the region's environmental and socio-economic challenges. The dearth of effective private-public partnerships has constrained the collaborative development and implementation of technologies that build upon traditional ecological knowledge (Muritala, 2022).

1.1 Problem setting and research objective

The overexploitation of resources, such as overfishing and deforestation, jeopardizes the long-term sustainability of the Lake Chad Basin's natural resources leading to unsustainable natural resource management.

Local communities in the Lake Chad Basin are deprived of access to innovative technologies that could improve the communal livelihoods and mitigate environmental challenges which resulting to limited access to innovative solutions.

Existing policies and frameworks may not sufficiently incorporate traditional ecological knowledge, thereby limiting its potential to inform technological development and sustainable resource management due to inadequate policy support.

The study focused on leveraging fishers' traditional ecological

knowledge (TEK) for technological development in Lake Chad Basin, Nigeria, private – public partnership approach. Specifically, the study looked to:

1. Explore the potential of leveraging fishers Traditional Ecological Knowledge for technological development in the Lake Chad Basin, Nigeria, through a private-public partnership approach;

2. Investigate how fishers Traditional Ecological Knowledge be integrated with modern science to drive technological development in the Lake Chad Basin, Nigeria;

3. Identify the key factors that facilitate successful private – public partnerships in the Lake Chad Basin, Nigeria.

This study could contribute to the existing body of knowledge on technological development through private – public partnership based on fisher's traditional ecological knowledge in Nigeria. The findings of the study may serve as a source of information for research purpose and policy makers for decision-making aimed at promoting the development of the Lake Chad Basin, Nigeria.

The study was carried out in in Mile 3 Baga, Fishing Community, Lake Chad Basin, Kukawa Local Government Area, Borno State, Nigeria. The study focused on fishers, persons and groups that were associated and considered important

in the study area for the purpose of this research work were used for the study in the study area. Interview for the research work was carried out from 22nd to 27th of each month “September, October and November 2023” in consideration of the end of production period of most farmers associated with intensive agricultural product marketing in the study area to enable acquisition of accurate and reliable information.

The study was carried out with the limitation of insufficient funding and insecurity as a result of Boko Haram insurgency conflict in the Lake Chad Basin region, Nigeria which has made it difficult in accessing the relevant materials and individual respondents in various communities in the study area. Fortunately, the limitation was overcome to the nearest minimum at last.

2. LITERATURE REVIEW

2.1. Conceptual Literature: Concept of Traditional Ecological Knowledge (TEK) and Technological Development

Traditional Ecological Knowledge (TEK) refers to the indigenous knowledge and practices of local communities regarding their environment and natural resources. Leveraging TEK for technological development involves combining

traditional knowledge with modern technology to create innovative solutions for sustainable development and understanding of the local ecosystems and traditional practices to inform technological development. Furthermore, promoting community engagement and participation in the development process for fostering sustainable resource management and environmental conservation (Rai and Mishra, 2022).

2.2. Theoretical Review

Traditional Ecological Knowledge (TEK) is a distinct body of knowledge which is indigenous practices and perspectives passed down through generations, emphasizing interconnectedness and holistic understanding of the relationships between humans and the environment. Traditional ecological knowledge offers valuable insights for sustainable development and environmental management. Western science and traditional ecological knowledge differ, traditional ecological knowledge is a valid form of science that enhance resource management, environmental conservation, adaptation to climate change and ecological health (Withanage and Lakmali Gunathilaka, 2023a).

Kyle Powys Whyte and George McGregor emphasizes the need to

understand Traditional Ecological Knowledge (TEK) within its cultural and historical context. This means considering the specific traditions, practices, and worldviews of indigenous communities. Traditional ecological knowledge is deeply rooted in the culture and traditions of the indigenous communities. Its not just a collection of knowledge, but a way of life that is closely tied to the land and the community (Withanage, and Lakmail Gunathilaka, 2023b).

George McGregor also highlights the importance of understanding TEK within its indigenous context. He argues that TEK is deeply rooted in the culture and traditions of indigenous communities. This means recognizing the value of indigenous knowledge and involving indigenous communities in the decision-making process (Withanage, and Lakmail Gunathilaka, 2023c).

Kyle Powys Whyte advocates for understanding traditional ecological knowledge as a collaborative concept. He believes that traditional ecological knowledge can facilitate cross cultural learning and mutual respect between different knowledge systems (Whyte, 2013a).

Kyle Powys Whyte proposes a collaborative approach, integrating traditional ecological knowledge with western science. This can help to ensure that both knowledge systems

learn from each other and work together to address environmental challenges (Whyte, 2013b).

George McGregor emphasizes the need for decolonization, recognizing the historical power imbalances between western science and indigenous knowledge systems (Withanage, and Lakmail Gunathilaka, 2023d).

Sandra Harding critiques western science for its limitations and biases. She argues that Western science often ignores or dismisses other knowledge systems, including traditional ecological knowledge. Harding emphasizes the importance of diversity in knowledge systems, recognizing the value of different perspectives and approaches (Withanage, and Lakmail Gunathilaka, 2023e).

2.3 Empirical Literature

According to Houde, (2007a) traditional ecological knowledge and Western science have different epistemological and ontological foundations. TEK is often based on holistic and relational understandings of the environment, while Western science tends to focus on reductionist and analytical approaches, which are notable differences that TEK has with scientific approaches characteristic of disciplines like ecology or biology. These differences can lead to varying

perspectives on environmental issues and management practices.

Nakashima et al (2012) demonstrated the effectiveness of traditional ecological knowledge in environmental management and conservation practices. TEK has practical applications for environmental governance, such as burning practices and observation of changes in water levels, sea ice, lake processes and the movements of animal populations. Recognizing the practical applications of TEK can help promote more effective environmental governance.

Kofinas (2005) research has highlighted the historical power imbalances between Western science and indigenous knowledge systems. Western science has often been imposed on indigenous communities, dismissing their knowledge and perspectives. Traditional ecological knowledge is perceived as being a competing authority with science, creating divisions between indigenous expert authorities and scientific expert authorities. These divisions can lead to conflicts and challenges in environmental governance and management.

Salmon (1996) indicates historical records and research have shown that western science has often been used as a tool of colonialism, imposing Western knowledge and

values on indigenous communities. Science has been tied to colonial, imperial and other discriminatory attitudes and institutions of science toward non-Western knowledge systems. Recognizing the historical context of Western science can help to address the power imbalances between Western science and indigenous knowledge systems.

Whyte (2013c) studies have shown that integrating traditional ecological knowledge (TEK) and Western science can lead to more effective environmental management and conservation practices. TEK can be integrated with science to improve environmental governance but requires creating long-term processes that allow for the implications of different approaches to knowledge to be responsibly thought through. Successful integration requires a deep understanding of the differences and similarities between TEK and Western science.

Gondo (2022) Collaborative approaches between traditional ecological knowledge and Western science can be effective in addressing environmental challenges, such as climate change, biodiversity conservation and natural resource management. A collaborative approach between TEK and Western science involves working together to share knowledge, expertise and

perspectives to achieve common goals. This approach can lead to more effective environmental management and conservation practices, as well as improved relationships between indigenous communities and Western scientists.

Houde (2007b) traditional ecological knowledge is based on careful observations and experiences of indigenous communities. TEK can provide valuable insights into environmental patterns and processes. TEK has empirically tested (and testable) understandings of the relationships among living things and their environments. TEK is a legitimate system of knowledge production that can inform environmental governance. Recognizing the empirical basis of TEK, helps to bridge the gap between TEK and Western science. Promote more inclusive and effective environmental governance.

3. METHODOLOGY

3.1 Research Design

Data for the study was obtained from primary and secondary sources. Both the primary and the secondary data were obtained with the application of survey method with the aid of checklist through interview to elicit information from the respondents on leveraging

fishers' traditional ecological knowledge (TEK) for technological development in Lake Chad Basin, Nigeria, private – public partnership approach.

3.2 Population of the Study

Kukawa local government area is domicile in Lake Chad Basin Area, Borno State of Nigeria. Kukawa Local Government Area is part of the prestigious Borno Emirate and consist of several towns and villages such as Alagarno, Yoyo, Kekeno, Kauwa, Baga Kauwa, Mile 3, Doron Baga among others. The kanuri language is widely spoken in the Local Government Area, while the religions of Islam and Christianity are practiced in the Local Government Area. Kukawa Local Government Area is situated on the shores of the Lake Chad and has an average temperature of 32 degrees centigrade. The area experiences two major seasons which are the dry and the rainy seasons. The average wind speed in the area is put at 11 kilometres per hour (OCHA, 2018). The study area is Mile 3 Baga Fishing Community, Lake Chad Basin, Kukawa Local Government Area, Borno State, Nigeria. It is in the semi- arid plain between latitude 12° 18' – 13° 48' N and longitude 13° 18' – 14° 48' East of the Greenwich Meridian (G.M.T) (Agbelege and

Ipinjolu, 2001). During the “Normal Chad” (stabilization of the Lake at normal size as a result of the influence of rainfall and volume of water flow in the major rivers that feed the basin), the composition of Lake Chad Basin comprised of Chad 11,000km² (50%), Nigeria 5,500km² (25%), Niger 3900km² (17%), and Cameroon 1800km² (8%), during the “Little Chad” the open water is shared only between Chad 1200km² (60%) and Cameroon 800km² (40%), the Nigerian and Niger portion are liable to complete drying, e.g. Sahelian drought of 1968 (Welcome, 1972).

The study area has a population of about two hundred and three thousand, three hundred and forty-three (203,343) inhabitants with a land area covering about 4,901km², National Population Commission of Nigeria (NPC, 2016). Fishing is an important economic activity in Kukawa Local Government Area as the residents of the area take advantage of the enormous sea food found in the area’s water bodies. Trade also flourishes in Kukawa Local Government Area. The fisheries of the Lake Chad employ about 10,000 fishers including about 150,000 persons associated with the fisheries business (Sule, Ovie and Ladu, 2001).

The major tribes from Nigeria include the Agatu, Hausa, Jukun,

Kanuri, Ijaw, Shuwa, Urhobo, Nupe, Ilaje and Ijebu and foreigners like Malian, Kotoko, Masaca, Buduma, Kanumbu. The Hausa constitutes the majority (19%) fishermen on the Nigerians part followed closely by the Jukun (16%), Agatu (11%), Malians constitute majority of the foreign fishers on the Lake. Fishing is their major occupation consisting of fisheries activities including processing, preservation, transportation and marketing. Other economic activities are farming, Cattle herding and trading, Federal Department of Fisheries (FDF), (Olaosebikan and Raji, 1998).

3.3 Sample Size and Sampling Procedure

Out of the study area total population of 203,343 inhabitants. The study targeted population of approximately 6000 to 7000 (FGD, FCFPT, Mile 3, Baga, 2023) fishers, persons and groups that are associated and considered important in the study area for the purpose of this research work were used for the study.

Survey method of data collection was employed (direct survey) the fish farmers were met at lake site, workshops for mending fishing gears, construction of fishing implements, Fish markets, fish packaging sites, fish processing and smoking sites,

mats and baskets weaving sites where production occur. This has enabled the acquisition of accurate information on the traditional ecological knowledge, cultural fishing acts and the level of operation of the cultural transformation system such as the types and the standard of the fishing gears and or implements in use and the associated methods and techniques in practice, fish farmers harvest, farm fixed assets capacity and farmers socioeconomic characteristics as applicable in the study area. Self-reporting through administrative sources (off-site) contact method was also applied for this study as information on the fishers were obtained from the research and consultancy unit, fishing gear unit, workshop unit, fish processing unit and library, information and documentation unit of the Federal College of Freshwater Fisheries Technology, Baga, Maiduguri in addition to information obtained from official of local government and state department of fisheries and other stakeholders of the fishing communities such as the traditional rulers and locally recognized heads of fishers and craftsmanship in the fishing community.

3.4 Sampling Method

The sampling method used in this study was combination of survey

method and direct enumeration. A purposive sampling technique, targeting fishers, persons, and groups associated with fishing activities in the study area. A total of 90 fishers were selected from three sub-sets, with 30 fishers from each sub-set. The sampling frame was constructed using checklist, and data was collected through interviews and direct observation.

The operational system of the survey was segregated in to three and were assigned sub-sample frame primarily constructed for the survey of the fishers on the formulated survey checklists as follows:

1. Identification of facilities from the production site of the farmer (field of operation) and administrative records of the fisheries institution, department of fisheries of local and state government and in the markets.

2. Direct enumeration of facilities in the production site (field of operation) in the lake site, workshops, markets and others not directly specified under a fish farmer, local producer and or a seller.

3. Interviews with the fishers, stake holders and other related members of the fishing industry either directly or indirectly related to matters connected with harvested species, permanence of equipment, the permanence density, the size of operation and on variables connected

with environmental and ecological effects of the fishing activities in the study area.

4. Self-reporting through administrative sources (off-site contact method).

3.5 Survey Questions

The survey questions applied are as stated below;

1. What are the existing traditional ecological knowledge (TEK) practices in Lake Chad Basin, Nigeria?

2. What are the traditional fishing acts and methods in Lake Chad Basin, Nigeria?

3. How can TEK be leveraged for technological development in the study area?

4. What are the potential benefits and limitations of integrating TEK with modern technology?

5. What are the key factors that facilitate successful private-public partnerships in the Lake Chad Basin, Nigeria?

6. How can TEK be documented and validated for technological development initiatives in the Lake Chad Basin, Nigeria?

7. What is the level of operation and fishing gear used in the Lake Chad Basin, Nigeria?

8. What are the potentials benefits and limitations of leveraging TEK for technological development?

9. What is the level of collaboration and knowledge sharing between stakeholders?

Example of Survey Questions includes;

a) What traditional fishing practices do you use, and how can they be improved with modern technology?

b) What traditional ecological knowledge practices do you use in your fishing activities?

c) How do you think TEK can be integrated with modern technology to improve fishing practices?

d) What are the benefits and limitations of leveraging TEK for technological development?

e) How can private – public partnerships support the integration of TEK into technological development initiatives?

3.6 Interview Analysis

The interview analysis was conducted with the used of conventional content analysis, which involved review and coding of interview data to identify themes and patterns in relations to the research objectives.

The analysis focused on exploring the potential of leveraging fisher's traditional ecological knowledge (TEK) for technological development in the Lake Chad Basin, Nigeria, through a private-public

partnership approach.

The interview data was analyzed to identify: -

1. Existing TEK practices and their relevance to technological development.

2. Potential benefits and limitations of leveraging TEK for technological development.

3. Factors facilitating successful private-public partnerships.

4. Suggestions for improving collaboration and knowledge sharing between stakeholders.

The analysis of the interview was carried out manually. Findings were presented in a narrative format, with quotes and examples from the interview data to support the results.

4. RESULTS AND DISCUSSION

4.1 Potential of Leveraging Fishers Traditional Ecological Knowledge (TEK) for Technological Development in the Lake Chad Basin, Nigeria, through a Private - Public Partnership Approach

The existing traditional ecological knowledge (TEK) practices in the Lake Chad Basin, Nigeria have been assessed based on the fact that Lake Chad Basin is home to diverse ethnic groups, each with their unique traditional ecological knowledge (TEK) practices such as knowledge

of aquatic plants, understanding of water level fluctuations. The fishers are educationally backward but are very skillful in term of fishing act and other fishing occupational activities as net making, packaging and un-packaging of fish, making and sales of twine (ropes), sales of fishing gears, hiring canoes, mending of fishing gears, production and sales of fishing cards for fish drying, fish marketing, processing and preservation of fish, loading and unloading of fish, transportation of fish, sorting of fish, fishing and boat building among others. Majority of the fishers have been fishing for over twenty (20) years. They have the experience of best times to fish, the best spots and the best techniques. The knowledge of the fishers in the study area will aid in the development of more efficient fishing gear and techniques.

The result aligns with the findings of Withanage, and Lakmail Gunathilaka, (2023a).

Utilization of the traditional ecological knowledge of the fishers to address specific technological challenges such aspects as to inform water management practices (Understanding traditional water harvesting, storage techniques etc.), to promote sustainable fishing practices (identifying and protecting critical fish habits etc.), to develop more effective irrigation systems and

sustainable agricultural practices in the study area. The farmers in the study area know the best crops to plant, the best time to plant and the best ways to manage our land. The knowledge of the fishers can be used to develop more effective irrigation systems and sustainable agricultural practices.

This result aligns with the findings of Withanage, and Lakmail Gunathilaka, (2023b).

There exists potential benefits and limitations of leveraging traditional ecological knowledge (TEK) for technological development in the study area which involves improved cultural sensitivity and relevance of technological developments, increased adoption and uptake of new technologies and enhanced sustainability and effectiveness of technological developments. The potential limitations are the risk of cultural appropriation or exploitation of traditional ecological knowledge, the need for careful documentation and validation of TEK practices and the potential for TEK to be marginalized or overlooked in favor of Western scientific knowledge.

This finding is consistent with the research of Nakashima, Galloway McLean, Thulstrup, Ramos, Castillo and Rubis, (2012).

The need for Private – public partnerships to facilitate the integration of traditional ecological

knowledge in to technological development initiatives by providing funding and resources for TEK documentation and validation, supporting the development of new technologies that build on existing TEK practices and facilitating collaboration and knowledge sharing between TEK holders, scientists, and policy makers which are lacking in the study area. Nevertheless, there is also no avenue for building trust, improving communication and ensuring transparency for successful partnership for the development of the economy of the local communities in the study area.

This result aligns with the findings of Withanage, and Lakmail Gunathilaka, (2023e).



Fig. 1 Cultural Fishermen in Fishing Act
Source: Library, Information & Documentation Unit, FCFPT, Mile 3, Baga, 2023

Note: Application of Cultural Fishing Implements such as Paddle, Wooden Canoe, Scoop Net and Gourd in Fishing Community.

4.2 Traditional Ecological Knowledge (TEK) Integration with Modern Technology in the Lake Chad Basin, Nigeria

There is no effective integration of traditional ecological knowledge (TEK) with modern technology in the study area considering the fact that, there is no deep understanding of the local context and TEK practices, collaboration and knowledge sharing between TEK holders, scientists, and technologists and a focus on developing technologies that are culturally sensitive and relevant to local needs is inadequate in the study area. The fishers believe that modern technology could improve their farming occupation as the members use mobile phones to access market information and get paid for their fish products, thus integration of traditional ecological knowledge with modern technology could improve the fisher's business, increase their incomes and acquisition of practical benefits in the techniques of fishing in the study area.

This result is inconsistent with the findings of Kofinas, (2005).

The fishers have rich cultural heritage and traditional knowledge in the fishing's community, thus, if the government and the private sector could work collaboratively as required the fisher's traditional knowledge could be documented

and preserved for the promotion of cultural tourism and improvement in economic development but the reverse has been the case in the study area as a result of ineffective collaboration. Hence, the advantage derivable from the development of new technologies through discovery of knowledge of the local environment and social conditions, identification of potential solutions to regional challenges for onward design and testing of new technologies is inadequate in the study area.

This outcome is consistent with those of Rai and Mishra, (2022).



Fig. 2 Cultural Inland Fishing Implement, Wooden Canoe



Fig. 3 Cultural Inland Fishing Implement, Tacht Canoe

Source: Gear Technology Workshop Unit, FCFPT, Mile 3, Baga, 2023

Note: Cultural Implements for Removing Fish from the Water Body and for Fish Processing and Preservation in the Study Area.

4.3 Private – Public Partnerships in the Lake Chad Basin, Nigeria

There exists ineffective collaboration between private and the public sector in the study as a result of the desired trust, communication and transparency for fostering collaboration between the stakeholders is not achieved. The majority of the fishers in the local communities (private sector) are willing to work with the government for the development of the economy with the notion that building trust, improving communication, ensuring transparency and fostering

partnership with the Western science (government) is very crucial for successful partnership.

This finding is inconsistent with those of Whyte, (2013b).

The fishers are of the point that the need for inclusive decision-making processes, regular communication and feedback mechanism for the actualization of full-swing stakeholders' engagement and participation which is ineffective to enable for technological development to prevailed in the study area. The fishers are investing and are ready to expand investment in the Lake Chad Basin but there is no stable and secure environment. The fishers also in need to work with the government in such a way that the fishers investments benefit everybody both the private and the public sectors in a sustainable way not only a few individuals.

This result aligns with the findings of Whyte, (2013c).

There is no adequate government policies and regulations that plays a critical role to facilitate private – public partnerships as there is no supportive regulatory framework in place to provide incentives for investment to enable partnerships goes hand in hand with national development goals. The government has not provided any support to create conducive environment for private – public partnerships such

as infrastructural and other services support, streamlining regulatory processes and offering tax incentives among others in the study area.

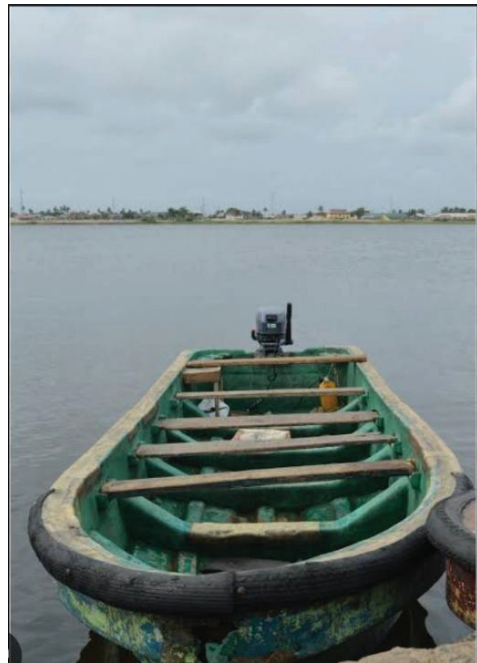
This finding is consistent with those of Gondo, (2022).

The issue of sustainability and long-term impact of private – public partnership does not arise as there exist no any private – public partnership framework in shape even if it exists, the sustainability and long-term impact of private-public partnerships required careful planning, monitoring and evaluation with due attention on local capacity building and promotion of ownership locally which is lacking in the study area. Working closely with local communities and the government enhances development of partnerships that benefit both the fishers in the local community and the government.

This result corroborates those of Houde, (2007b).



Fig. 4 Traditional Ecological Knowledge (TEK) Transformation of Fishing Implement (Canoe) in the Study Area, Dugout Canoe



Engine Boat



Outboard Engine



Motor Boat

Source: Gear Technology Workshop Unit, FCFFT, Mile 3, Baga, 2023

Note: Traditional Ecological Knowledge (TEK) Transformation of Fishing Implement (Canoe/Outboard Engine) in the Study Area

5. CONCLUSIONS

The study revealed that Traditional Ecological Knowledge (TEK) practices exist in the study area and could be leveraged for technological development, particularly in the areas of water resources management and sustainable fishing practices. While private-public partnerships are considered a crucial instrument for facilitating the integration of traditional ecological knowledge in to technological development initiatives, they also pose a significant challenge in the study area. Nevertheless, the study highlights the importance of government policies and regulations in supporting these partnerships and promoting the accomplishment of research objectives, a support that is currently lacking in the study area. The study has the potential to drive economic growth, improve livelihoods, and promote sustainable development but lacks careful planning, collaboration, and knowledge sharing between stakeholders such as the local community fishers, scientists, policy makers, and private sector representatives. The importance of the idea of building trust, improving communication, and ensuring transparency in private-public partnership in the development of technology on the basis of traditional ecological knowledge has been revealed by the study.

Based on the study's findings, the following recommendations are proposed:

1. Documentation and Validation of Traditional Ecological Knowledge (TEK) Practices: Collaborative efforts between the government and private sector are necessary to document and validate Traditional Ecological Knowledge (TEK) Practices in the Lake Chad Basin, Nigeria.

2. Culturally Sensitive Technology Development: Technologies developed for the region should prioritize cultural sensitivity and relevance to local needs.

3. Collaboration and Knowledge Sharing: Encouraging collaboration and knowledge sharing among traditional ecological knowledge holders, scientists, policy makers, and private sector representatives is crucial for integrating traditional ecological knowledge into technological development initiatives.

4. Supportive Regulatory Framework: The government should establish a supportive regulatory framework for private-public partnerships, such tax incentives, streamlined processes, and infrastructure support.

5. Sustainability and Long-term Impact: Private-public partnerships should be designed with a focus on sustainability and long-term impact,

prioritizing local capacity building and promoting local ownership.

6. Inclusive Decision-Making: Decision-making processes should be inclusive, providing opportunities for stakeholder participation and feedback.

7. Monitoring and Evaluation: Regular monitoring and evaluation of private-public partnerships are essential to ensure they meet their objectives and positively impact local communities.

DATA AVAILABILITY STATEMENT

All data are included in the manuscript. Data can be shared due to non-confidentiality and has no any ethical restrictions.

AI DISCLOSURE

I Babagana Zanna acknowledge the used of Meta AI only for language editing under my complete control and responsibility. I accept the full responsibility for the accuracy and integrity of the final version.

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