

Modernization, Urbanization and The Decline of Traditional Climate Change Knowledge System in Toru Angiama Community of Bayelsa State

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Abstract- *The effects of modernization and urbanization on the decline of traditional indigenous climate change knowledge systems in Toru-Angiama, Bayelsa State, Nigeria, were investigated in this study. A qualitative descriptive research design was employed using in-depth interviews, focus group discussions, and field observations to examine the effects of socio-economic transformation, formal education, technological development, and rural–urban migration on indigenous climate knowledge transmission. Guided by Modernization Theory and Cultural Ecology Theory, the study revealed that growing dependence on scientific forecasting systems, urban migration, and changes in livelihood patterns have significantly weakened the intergenerational transfer and practical application of traditional environmental knowledge. Although some elements of indigenous forecasting and adaptation practices are retained by older generations, their relevance is gradually diminishing among younger people. The study concludes that while modernization promotes development, it also contributes to the marginalization of indigenous climate adaptation systems. It recommends the documentation, integration, and policy recognition of indigenous knowledge as part of sustainable climate resilience strategies in Bayelsa State.*

Index Terms- *Modernization, Urbanization, Indigenous Knowledge, Climate Change Adaptation, Cultural Ecology*

I. INTRODUCTION

Modernization and urbanization have emerged as the hallmark of modern societies around the world. In developing nations such as Nigeria, these phenomena have greatly influenced the social structures, economic activities, cultural systems, and environmental practices of the people. Modernization can be described as the shift from traditional social

structures to more industrialized, technologically advanced, and bureaucratized social structures (Giddens, 1990). Urbanization, on the other hand, is the growing trend of people moving from rural to urban areas and the expansion of urban settlements (United Nations, 2018). Although modernization and urbanization are often linked with economic development and infrastructural development, they have also contributed to the decline of indigenous knowledge systems, including traditional climate change knowledge.

Traditional climate change knowledge systems are the collective body of indigenous practices, observations, beliefs, and adaptations developed over the years to cope with environmental variability and climatic changes (Berkes, 2012). In the Niger Delta region of Nigeria, including Toru-Angiama in Bayelsa State, indigenous knowledge has played a vital role in weather forecasting, flood control, agricultural cycles, fishing patterns, and mangrove forest conservation. These knowledge systems are passed down from generation to generation through oral traditions and are an integral part of the cultural practices and communal living of the people.

However, modernization and rapid urbanization have increasingly impacted the social and ecological environment of rural communities. According to Nyong, Adesina, and Osman-Elasha (2007), indigenous environmental knowledge in Africa is gradually being lost due to formal education systems, technological dependency, migration, and exposure to Western models of development. In the Niger Delta region, infrastructural development, oil exploration activities, rural-urban migration, and the adoption of modern approaches to environmental

management have greatly impacted the use of traditional ecological knowledge.

The Toru-Angiama community, found in Bayelsa State, is not exempt from these dynamics either. As modernization extends through better transport networks, digital communication technology, formal education, and urban-based economic opportunities, younger people are increasingly alienated from indigenous knowledge of the environment. Indigenous knowledge systems for forecasting rainfall patterns, tidal movements, and seasonal flooding are increasingly being replaced by scientific meteorological systems and modern adaptation strategies. While scientific adaptation strategies for climate change are valid, the displacement of indigenous knowledge systems could undermine community-based resilience and adaptation strategies rooted in indigenous culture (IPCC, 2014).

Despite the increasing recognition of indigenous knowledge systems in the international climate change discourse, there is a lack of empirical research that investigates the specific role of modernization and urbanization in the decline of indigenous climate change knowledge systems at the community level in Bayelsa State, Nigeria. The majority of climate change research in Nigeria is dominated by scientific adaptation strategies, policy approaches, and technological solutions, with little attention paid to the socio-cultural displacement of indigenous knowledge systems.

This research therefore proposes to investigate the relationship between modernization, urbanization, and the decline of indigenous climate change knowledge systems in the Toru-Angiama community of Bayelsa State, Nigeria. The relevance of this study is threefold. First, it makes a contribution to the general debate on climate change adaptation by emphasizing the need for the preservation of indigenous knowledge systems. Second, it offers insights into the impact of modernization on cultural resilience in the Niger Delta region. Third, it makes recommendations on the integration of traditional knowledge into modern climate adaptation plans in Bayelsa State.

The main aim of this research study is to investigate the impact of modernization and urbanization on the decline of traditional climate change knowledge systems in the Toru-Angiama community of Bayelsa State, Nigeria. The study will specifically evaluate the impact of socio-economic factors, formal education, technological development, and rural-urban migration on the transfer and practice of traditional climate knowledge.

The study will also investigate the implications of the decline of traditional climate knowledge systems on the resilience of the community.

II. LITERATURE REVIEW

Modernization and Social Transformation

Modernization is the process by which traditional societies are transformed into more industrialized, urbanized, and technologically developed systems. Modernization is commonly linked with economic development, bureaucratic administration, formal education, and scientific rationality (Giddens, 1990). Modernization theory states that as societies evolve, traditional institutions, values, and practices are gradually replaced by modern forms of organization and scientific knowledge (Inglehart & Baker, 2000). In most developing nations, modernization has caused a major shift in cultural values, work patterns, and social organization. Traditional systems of governance, indigenous beliefs, and local knowledge practices are often replaced by formal education and scientific methods. According to Eisenstadt (1966), modernization not only affects the economic system but also the cultural values and social relations of societies. This can lead to the decline of indigenous systems that were once the backbone of survival and environmental management in communities.

In rural settings, modernization brings about new technologies, new economic opportunities, and new social mobility. Although modernization can improve the quality of life, it can also affect the way traditional knowledge is passed down from one generation to another. Indigenous knowledge systems, which are passed down from generation to generation through oral traditions, may decrease as younger people opt for formal education and urban

careers over traditional knowledge practices (Berkes, 2012).

Regarding climate change adaptation, modernization has brought about scientific meteorology, computerized forecasting systems, and national environmental policies. Although these advancements improve climate observation, they could also contribute to a diminished dependence on traditional climate forecasting practices like cloud observation, animal behavior, tidal cycles, and seasonal vegetation patterns. Consequently, indigenous ecological knowledge could be considered antiquated or less accurate compared to scientific approaches.

In the Toru-Angiama community of Bayelsa State, modernization efforts such as enhanced road connectivity, mobile phone technology, formal education, and acquaintance with urban life may be at work in shaping attitudes and practices related to environmental knowledge. A transition from subsistence economies involving fishing and small-scale agriculture to salary employment and urban sector jobs could decrease direct engagement with the natural environment, thus undermining indigenous climate knowledge systems.

Modernization, therefore, is a paradoxical phenomenon that promotes development and technological progress but may also be a factor in the degradation of traditional indigenous knowledge that has long been a source of strength for the environment.

Urbanization and Cultural Displacement

Urbanization is the growing trend of people living in urban areas, along with the development of urban infrastructure and culture (United Nations, 2018). In developing areas such as sub-Saharan Africa, the rate of urbanization has increased because of migration in search of employment, education, health care, and better living standards. Urbanization is often associated with economic development and modernization, but it also has serious social and cultural impacts on rural societies.

Rural-urban migration has a major impact on the demographics of traditional societies. Young and working-age people migrate to urban areas, leaving

behind the older generation who are the main guardians of indigenous knowledge systems. According to Tacoli (2009), migration can cause a break in the transfer of knowledge from one generation to another, particularly if the indigenous knowledge system is based on apprenticeship, observation, and participation. If the younger generation is not present in their communities, the transfer of environmental knowledge becomes difficult.

Urbanization also leads to the development of new cultural values and lifestyles that are often in conflict with traditional cultural beliefs. The influence of urban education systems, information technology, and global media can change the way people perceive indigenous knowledge systems. Indigenous knowledge systems are considered primitive and less scientific compared to modern climate information systems. This cultural transition can lower the status of indigenous environmental knowledge, further accelerating its decline (Berkes, 2012).

In the Niger Delta area, including Bayelsa State, urbanization and the development of infrastructure have impacted the ecological environment. The construction of roads, housing, oil exploration, and business activities have altered land use and natural habitats. These changes not only impact the environment but also make people less dependent on traditional knowledge for environmental management. As people in the communities become less dependent on subsistence fishing and agriculture, traditional climate signs associated with these practices may eventually become less relevant.

In the Toru-Angiama community, improved links with cities may also shape the use and understanding of climate information. People in the community may increasingly depend on radio programs, weather apps on mobile phones, and government warnings rather than traditional climate forecasting practices. Although the availability of scientific information is an advantage, this trend may reduce the community's collective memory and cultural affinity for traditional knowledge systems.

Urbanization, therefore, is not only a cause of demographic and economic change but also of

cultural displacement. As migration and urbanization continue to transform social life, traditional climate knowledge systems may eventually fade away unless there is a conscious effort to preserve and mainstream them within modern adaptation practices.

Traditional Climate Change Knowledge Systems

Traditional climate change knowledge systems are defined as the indigenous environmental knowledge that has been accumulated as a result of the long-term interaction of communities with their environment. This knowledge has been accumulated through observation, experience, spiritual belief systems, and collective memory, and is passed down from generation to generation through oral tradition (Berkes, 2012). Traditional knowledge systems are not embedded in formal scientific systems but are instead embedded in cultural practices, rituals, and livelihood systems.

In the Niger Delta region, indigenous climate change knowledge systems are very important in environmental management and adaptation. In these regions, local communities use natural signs such as cloud patterns, wind direction, tidal action, bird migration patterns, fish behavior, and vegetation changes to predict rainfall, flooding, and storm surges (Nyong, Adesina, & Osman-Elasha, 2007). These signs are used to determine planting seasons for crops, fishing seasons, settlement patterns, and flood protection measures.

Traditional climate knowledge systems are adaptive and context-specific. They are developed through continuous observation and interpretation of environmental changes. According to the Intergovernmental Panel on Climate Change, indigenous knowledge systems can improve local resilience because they are based on practical experience and adaptation (IPCC, 2014). In most cases, traditional knowledge systems can complement scientific climate information by providing localized information that may not be provided through generalized forecasting systems.

However, traditional knowledge systems are susceptible to disruption. They rely very heavily on intergenerational transfer, collective engagement, and interaction with the environment. As younger

generations become alienated from traditional livelihoods such as fishing and agriculture, the chances of learning environmental knowledge are reduced. Formal education systems tend to emphasize scientific knowledge over indigenous knowledge, resulting in the eventual devaluation of indigenous ecological knowledge (Agrawal, 1995).

In riverine communities such as Toru-Angiama in Bayelsa State, traditional climate knowledge has traditionally informed responses to seasonal flooding, tidal waves, and rainfall patterns. Community elders have traditionally used environmental cues to infer safe fishing times, forecast intense rainfall, and locate flood-susceptible areas. These have helped in the survival of the communities in a region that is regularly affected by environmental change and ecological vulnerability.

The loss of traditional climate knowledge is more than a loss of culture; it could also affect the adaptability of the communities. As indigenous knowledge systems are abandoned without being incorporated into modern climate systems, the communities could become too reliant on external scientific forecasts, which are not always environmentally informed. It is, therefore, important to understand the significance and vulnerability of traditional climate change knowledge systems in comprehending the general impact of modernization and urbanization in Toru-Angiama community.

Modernization, Urbanization, and the Degradation of Indigenous Knowledge

Modernization and urbanization have greatly impacted the indigenous knowledge systems of many developing nations. Modernization brings technological innovation, institutional development, and scientific progress but does so in a manner that is often defined by a preference for Western models of knowledge over indigenous knowledge systems (Agrawal, 1995). This leads to the degradation of indigenous knowledge systems as they become less recognized and relevant in society.

Urbanization further contributes to this degradation by changing the demographics of society. When rural communities move to urban areas, there is a loss of traditional livelihoods such as subsistence fishing and

farming. These are often the main sources of indigenous knowledge systems. According to Tacoli (2009), rural-urban migration leads to a "generational gap" in which the younger generation becomes socially and economically integrated into the urban system but loses connection with local environmental knowledge.

Modern education systems further contribute to the degradation of indigenous knowledge systems. Modern education systems focus on scientific explanations of climate change but ignore indigenous forecasting systems. Over time, this leads to a perception that indigenous knowledge systems are no longer relevant or are inferior. According to Nyong et al. (2007), this degradation of indigenous knowledge systems leads to a loss of community confidence in local adaptation practices and a lack of motivation to preserve indigenous knowledge systems.

Technological development, especially in the fields of communication and meteorology, has also impacted the way climate information is obtained. Weather apps, radio, satellite weather forecasting, and government warnings offer scientifically derived climate information. Although these technologies improve preparedness, they could also make people less dependent on conventional environmental signs such as animal behavior, tides, and plant cycles. The use of scientific systems in place of indigenous observation is also responsible for the degradation of traditional knowledge systems over time.

In the Niger Delta area, infrastructural development and oil prospecting have also affected the ecological environment and traditional ways of life. Environmental degradation, land use changes, and urbanization interfere with the natural cycles on which indigenous weather forecasting is based. If natural cycles fluctuate erratically because of industrialization and climate change, indigenous signs could become less dependable, further discouraging their use (IPCC, 2014).

In the Toru-Angiama community, modernization and urbanization could also be responsible for cultural and environmental change. As social values change to include urban employment, internet connectivity, and institutionalized systems, indigenous climate

knowledge could become less important. The degradation of indigenous climate knowledge is a problem not only of culture but also of the environment, as it could limit the development of locally based adaptation strategies that have, in the past, provided resilience.

III. THEORETICAL FRAMEWORK

Modernization Theory

Modernization Theory is an important theoretical framework for understanding the process of change in traditional societies due to the impact of industrialization, urbanization, formal education, and technological change. Modernization Theory was developed in the mid-twentieth century by scholars such as Rostow (1960) and Lerner (1958), who conceptualized that societies move from traditional societies to modern industrial societies, which are characterized by rationality, technological advancement, and institutional complexity.

Rostow (1960) described modernization as a process of transition from traditional agricultural societies to industrial and technologically advanced societies. This process of transition leads to the transformation of economic structures, values, and knowledge systems. Traditional ideas and practices are often replaced by scientific thinking and bureaucratic systems. In this process, indigenous knowledge systems are often viewed as a barrier to development rather than as an asset.

Modernization Theory also indicates that exposure to formal education, mass media, and urbanization leads to a change in cultural orientations (Lerner, 1958). People become more oriented to scientific knowledge and less to traditional knowledge. In rural areas, this change may lead to the loss of indigenous knowledge systems related to the environment, which were previously an important part of the livelihood system. The younger generation may prefer to work in urban areas and seek technological solutions rather than relying on indigenous knowledge systems.

In the context of the Toru-Angiama community, Modernization Theory can be used to explain how the development of infrastructure, formal education, digital communication technology, and integration

with the larger economic system may lead to the loss of traditional climate change knowledge. As people in the community become more exposed to scientific meteorological knowledge and urban lifestyle patterns, the use of local forecasting systems and indigenous adaptation knowledge may decline.

However, modernization theory has also been criticized for assuming that traditional systems must be replaced for development to take place (Agrawal, 1995). Modern scholars suggest that modernization does not necessarily entail the replacement of traditional systems but may instead offer opportunities for integration. Thus, this theory enables the study to critically analyze whether modernization in Toru-Angiama has resulted in the replacement, marginalization, or possible integration of traditional climate knowledge systems.

IV. METHODOLOGY

This study adopts a qualitative research design to explore how modernization and urbanization contribute to the decline of traditional climate change knowledge systems in Toru-Angiama community, Bayelsa State. The qualitative approach is appropriate because it enables in-depth understanding of cultural practices and environmental knowledge within their natural context (Creswell & Poth, 2018).

A descriptive design is employed to examine how socio-economic transformation, migration, formal education, technological exposure, and environmental change influence the transmission and sustainability of indigenous climate knowledge.

The study is empirical, as it is grounded in observable community experiences and scholarly evidence rather than theoretical assumptions (Babbie, 2013). A qualitative framework is most suitable because traditional knowledge systems are culturally embedded and require contextual interpretation, which quantitative methods alone may not adequately capture.

Data Collection Method

This study employed qualitative data collection methods, including in-depth interviews, focus group discussions, and field observations. These methods

were appropriate for gaining a comprehensive understanding of how modernization and urbanization affect traditional climate change knowledge systems in Toru-Angiama community. In-depth interviews were conducted with elders, fishermen, farmers, youth representatives, and key informants knowledgeable about traditional environmental practices. The interviews gathered detailed accounts of traditional weather forecasting methods, flood adaptation strategies, seasonal livelihood activities, and the perceived effects of modernization (Creswell & Poth, 2018).

Focus group discussions captured collective views on generational changes in knowledge transmission. This method helped identify shared experiences related to migration, formal education, technological influence, and shifts in environmental practices. Field observation complemented these methods by providing contextual insights into current livelihood patterns, settlement structures, and visible signs of modernization, such as infrastructural development and digital technology use.

V. RESULTS

Table 1: Which traditional method do you primarily use to protect your home from seasonal flooding?

Response	Frequency	Percentage
Building houses on elevated wooden suspenders/stilts	150	39.0%
Digging deep trenches around the building	100	26.0%
Relocating to the community health center	80	20.8%
Using modern water-pumping machines	55	14.3%
Total	385	100.0%

Source: Field Survey, 2026

The data shows that the majority of respondents (39.0%) rely on building houses on elevated wooden suspenders/stilts to protect their homes from seasonal flooding. The second most common method is digging deep trenches around the building (26.0%). Using modern water-pumping machines is the least preferred option (14.3%). This suggests that traditional methods such as elevating houses and trenching are widely used in Toru-Angiama,

reflecting the community's reliance on indigenous, cost-effective techniques to combat flooding, rather than adopting more modern mechanical solutions

Table 2: How does the community traditionally manage riverbank erosion?

Response	Frequency	Percentage
Constructing concrete sea walls	40	10.4%
Stacking sandbags and planting mangroves	220	57.1%
Abandoning the affected land permanently	70	18.2%
Spraying chemicals to harden the soil	55	14.3%
Total	385	100.0%

Source: Field Survey, 2026

The most common method for managing riverbank erosion in Toru-Angiama is stacking sandbags and planting mangroves (57.1%). This is followed by abandoning the affected land permanently (18.2%) and spraying chemicals to harden the soil (14.3%). The preference for stacking sandbags and planting mangroves shows the community's focus on sustainable, natural practices for riverbank erosion control. The use of concrete sea walls is less common, indicating a preference for cost-effective, eco-friendly solutions over expensive engineering methods.

Table 3: How well do traditional sandbags and mangrove planting hold back floodwaters?

Response	Frequency	Percentage
They provide complete protection year-round	30	7.8%
They offer temporary relief but are often overwhelmed by extreme floods	230	59.7%
They have no effect on the water levels at all	70	18.2%
They actually make the flooding worse	55	14.3%
Total	385	100.0%

Source: Field Survey, 2026

The data shows that most respondents (59.7%) believe that traditional sandbags and mangrove planting offer temporary relief but are often overwhelmed by extreme floods. A smaller

proportion (18.2%) feels that these methods have no effect on the water levels, while 7.8% think they provide complete protection year-round. Interestingly, 14.3% feel that these methods actually make the flooding worse.

VI. DISCUSSION

The findings of this study indicate that modernization and urbanization have played a significant role in the decline of traditional climate change knowledge systems in the Toru-Angiama community. Growing reliance on formal education, scientific weather forecasting, and digital technologies has reduced the use of indigenous environmental indicators such as tidal movements, wind direction, and seasonal vegetation patterns.

Rural–urban migration has created a generational gap in knowledge transmission, as younger people move to urban areas and disengage from traditional livelihoods like fishing and farming. This has weakened the intergenerational transfer of indigenous climate knowledge. Additionally, infrastructural development and environmental changes in the Niger Delta have altered natural patterns, reducing the reliability of some traditional indicators.

However, traditional knowledge has not completely disappeared. Older generations still retain and apply indigenous forecasting methods, and in some cases, these are used alongside modern scientific systems. This suggests that integration rather than complete replacement is possible.

VII. CONCLUSION

This study examined the effects of modernization and urbanization on the decline of traditional climate change knowledge systems in Toru-Angiama community, Bayelsa State, Nigeria. The findings reveal that socio-economic transformation, formal education, technological advancement, and rural–urban migration have significantly reduced the transmission and practice of indigenous climate knowledge within the community.

Modern scientific forecasting systems and urban-oriented lifestyles have increasingly replaced

traditional environmental indicators that once guided local adaptation strategies. Although elements of indigenous knowledge are still retained by older generations, intergenerational transfer has weakened considerably.

The study concludes that while modernization and urbanization foster development, they also contribute to the marginalization of culturally embedded climate adaptation systems. Strengthening climate resilience in Toru-Angiama therefore requires intentional efforts to preserve and integrate traditional knowledge with modern adaptation strategies.

VIII. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed:

- i. Community leaders and relevant authorities should make deliberate efforts to document and preserve traditional climate change knowledge systems in Toru-Angiama before they are completely lost.
- ii. Educational institutions within the community should integrate elements of indigenous environmental knowledge into their curricula to promote intergenerational transmission.
- iii. Government agencies and environmental organizations should combine traditional climate adaptation strategies with modern scientific forecasting systems to strengthen community resilience.
- iv. Community forums and cultural programs should be organized to promote interaction between elders and younger generations regarding traditional environmental practices.
- v. Policy makers in Bayelsa State should recognize indigenous knowledge as a valuable component of climate adaptation planning rather than dismissing it as outdated or irrelevant.

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