ISSN: 2978-3801

Journal of Global Warming and Climate Change

SCIENTIFIC Research and Community

Review Article

Open Access

Technocratic Green and the Silence of Local Knowledge: The Case of the Bakolori Dam in Sokoto State, Nigeria

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ABSTRACT

This paper examines the tensions between technocratic environmental governance and indigenous ecological knowledge through the case of the Bakolori Dam project in Sokoto State, Nigeria. Conceived as a large-scale irrigation and agricultural modernization initiative, the project was designed to improve food production and stimulate rural development. However, its implementation largely excluded the local farming communities whose livelihoods depended on traditional floodplain agriculture and seasonal ecological patterns. Adopting a qualitative, comparative case study methodology, the study draws on historical records, scholarly literature, policy documents, and documented community experiences to analyze the environmental and social consequences of the project. Guided by the framework of political ecology, the paper reveals how the privileging of technical expertise over indigenous knowledge disrupted local ecological systems, reduced agricultural productivity, displaced communities, and deepened social inequalities. The study argues that technocratic approaches to sustainability often conceal power relations that marginalize local agency and environmental knowledge. It concludes that inclusive and participatory environmental governance that recognizes indigenous ecological knowledge is essential for achieving sustainable and socially just development in Africa.

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Received: May 13, 2026; **Accepted:** May 19, 2026; **Published:** May 27, 2026

Keywords: Technocratic Environmental Governance, Indigenous Ecological Knowledge, Political Ecology, Bakolori Dam

Introduction

Large-scale development projects are often presented as symbols of progress, modernization, and environmental improvement. In many postcolonial African states, dams, irrigation schemes, and river-basin projects have been promoted as technical solutions to food insecurity, rural poverty, water scarcity, and agricultural underproduction. Yet, beneath this promise of development lies a deeper question: whose knowledge counts in defining sustainability? While engineers, planners, state agencies, and international development institutions often privilege scientific and technical expertise, local communities also possess long-established ecological knowledge built through generations of interaction with land, water, seasons, and farming systems. Recent debates in environmental governance increasingly emphasize that sustainable development must not be reduced to infrastructure and expert planning alone, but must include community participation, local ecological knowledge, and social justice [1].

The Bakolori Dam in Sokoto State, Nigeria, provides an important historical case for examining this tension. Constructed as part of a wider irrigation and agricultural modernization agenda, the project was intended to improve agricultural productivity and transform rural livelihoods. However, studies of the Bakolori Irrigation Project show that its implementation generated serious social and environmental consequences, including displacement of farmers, inadequate compensation, destruction of farmland and economic trees, and conflicts over land and water access [2]. What was framed as development became, for many affected communities, a disruption of existing livelihood systems that had depended on local knowledge of seasonal flooding, flood-recession farming, soil conditions, and water-use practices.

From a political ecology perspective, the Bakolori case demonstrates that environmental interventions are never purely technical. They are also political because they involve decisions about land, authority, knowledge, access, and power. Adams shows that the Bakolori project created tensions between state-led planning and the needs of downstream users whose farming systems depended on carefully timed water flows. In this sense, the problem was not merely that the dam altered the physical environment, but that the planning process failed to adequately recognize the knowledge and agency of the people most affected by the project [3,4].

This paper therefore examines the Bakolori Dam as a cautionary example of what may be described as "technocratic green" development: a model of sustainability that relies heavily on expert-driven infrastructure while marginalizing local voices. It argues that when development planning privileges engineering knowledge over indigenous and community-based ecological experience, it risks reproducing inequality under the language of progress. By focusing on the silence of local knowledge in the Bakolori Dam project, the paper contributes to broader discussions on environmental justice, participatory governance, and the need to integrate local ecological knowledge into sustainable development planning.

Statement of the Problem

Development projects framed as environmentally sustainable are often designed through technocratic approaches that prioritize engineering expertise and state planning over the lived experiences of local communities. In many cases, such interventions fail to recognize indigenous ecological knowledge systems that have historically guided resource management and environmental adaptation. This exclusion creates a gap between development objectives and the socio-environmental realities of affected populations.

The Bakolori Dam project in Sokoto State illustrates this problem. Although conceived as a modern irrigation and agricultural development initiative, the project disrupted traditional floodplain farming systems and marginalized the local knowledge of farming communities whose livelihoods depended on seasonal ecological patterns. Existing discussions on the Bakolori Dam have largely focused on economic and political consequences, with limited attention to how technocratic environmental governance silenced local ecological knowledge. This paper therefore examines how the privileging of technical expertise over indigenous experience contributed to environmental and social inequalities in the Bakolori Dam project.

Objectives of the Study

The main objective of this study is to examine the tensions between technocratic environmental governance and local ecological knowledge through the case of the Bakolori Dam project in Sokoto State, Nigeria.

The Specific Objectives are to:

- Examine how the Bakolori Dam project disrupted traditional ecological and farming practices of local communities in Sokoto State;
- Analyze the role of technocratic planning in marginalizing indigenous ecological knowledge during the implementation of the Bakolori Dam project; and
- Assess the implications of excluding local knowledge for sustainable and inclusive environmental governance.

Significance of the Study

This study contributes to ongoing debates on sustainability, environmental governance, and development in Africa by highlighting the often-overlooked role of indigenous ecological knowledge in large-scale environmental projects. Using the Bakolori Dam as a case study, the paper demonstrates how technocratic development approaches can produce environmental and social inequalities when local communities are excluded from decision-making processes.

The study is significant because it challenges narrow interpretations of "green" development that prioritize technical expertise while marginalizing local experiences and ecological practices. It provides insights for policymakers, environmental planners, and development agencies on the importance of integrating community knowledge into environmental governance and rural development initiatives. The paper also contributes to political ecology scholarship by situating the Bakolori Dam within broader discussions of power, knowledge hierarchies, and environmental justice in postcolonial Africa.

Literature Review

Technocratic Environmental Governance and Development

Technocratic environmental governance refers to development approaches that prioritize scientific expertise, engineering solutions, and centralized state planning in addressing environmental and developmental challenges. Within this framework, environmental problems are often interpreted as technical issues requiring technical solutions, while social, cultural, and indigenous perspectives receive limited attention. Political ecologists argue that such approaches frequently conceal relations of power by presenting development decisions as neutral and objective rather than political and contested [5].

In postcolonial African states, large-scale dam and irrigation projects became central symbols of modernization and national development during the twentieth century. Governments viewed dams as instruments for increasing agricultural productivity, generating electricity, controlling floods, and promoting economic transformation. However, scholars increasingly note that many of these projects were implemented through top-down planning structures that marginalized local participation and ignored community ecological systems [6]. Recent studies in environmental governance also emphasize that sustainability initiatives often reproduce older colonial patterns of resource control when they privilege institutional expertise over indigenous environmental knowledge [7].

Political ecology literature further explains that environmental governance is deeply connected to questions of authority, access, and recognition. According to Malik, political ecology examines how environmental policies and interventions distribute benefits and burdens unevenly across society while shaping whose voices are recognized in decision-making processes [5]. This perspective is important for understanding the Bakolori Dam because the project was not simply an irrigation initiative but also a political process that restructured local relationships with land, water, and agricultural production.

The concept of "technocratic green" development emerges from these debates. It describes situations where projects presented as environmentally sustainable or developmental rely heavily on technical expertise while excluding local communities from meaningful participation. Although such interventions are often justified in the language of modernization, food security, and sustainability, they can produce environmental injustice by silencing indigenous ecological knowledge and disrupting local livelihoods. Contemporary environmental scholars increasingly advocate participatory and inclusive models of environmental governance that recognize local communities as active knowledge holders rather than passive beneficiaries of development (Conservation and Environmental Management Reimagined, 2026).

Indigenous Ecological Knowledge and Environmental Sustainability

Indigenous ecological knowledge refers to the accumulated experiences, practices, beliefs, and environmental understanding developed by local communities through long-term interaction with their ecosystems. This knowledge is often transmitted across generations through oral tradition, observation, practice, rituals, and communal memory. Recent environmental scholarship recognizes indigenous knowledge as an important component of biodiversity conservation, climate adaptation, and sustainable resource management [8].

Ayeni argues that indigenous knowledge systems provide localized environmental insights that are often absent in scientific planning models, particularly in African environmental management contexts [7]. Such knowledge systems are adaptive because they

emerge from direct ecological experience and are shaped by local environmental realities. In many African rural communities, traditional farming systems, seasonal water management practices, and communal land-use arrangements evolved over centuries as mechanisms for coping with environmental uncertainties.

Recent scholarship also emphasizes that sustainability cannot be achieved through scientific knowledge alone. Rather, sustainable environmental governance requires collaboration between scientific and indigenous knowledge systems [7]. Scholars argue that the exclusion of local ecological knowledge weakens environmental policies because it ignores contextual realities and reduces community ownership of development initiatives. This argument aligns with broader debates in political ecology which maintain that environmental governance becomes more effective and equitable when local communities participate meaningfully in planning and decision-making processes.

Within water and climate governance studies, researchers increasingly stress that environmental crises are socially and politically constructed rather than purely technical phenomena [6]. Consequently, communities living within specific ecological environments often possess practical environmental knowledge that may improve adaptation and resilience strategies. Studies on ecosystem restoration and environmental management similarly show that local ecological knowledge contributes to environmental sustainability because it reflects lived environmental experiences and localized adaptation mechanisms [9].

The relevance of indigenous ecological knowledge to the Bakolori case lies in the traditional floodplain farming systems practiced by local communities prior to the construction of the dam. Farmers had developed agricultural systems based on seasonal flooding cycles, river behavior, soil fertility patterns, and water timing. These practices reflected localized environmental understanding suited to the ecological conditions of the Sokoto River Basin. However, the implementation of the Bakolori project largely ignored these systems in favor of centralized irrigation planning.

The Bakolori Dam and the Disruption of Local Ecological Practices

The Bakolori Dam project in Sokoto State emerged during Nigeria's postcolonial modernization drive aimed at expanding irrigation agriculture and increasing food production. The project was initiated in the 1970s and formed part of broader state-led agricultural development policies in northern Nigeria. The dam was designed to support a large-scale irrigation scheme intended to transform agricultural production in the Sokoto-Rima Basin.

Before the construction of the dam, communities along the Sokoto floodplain practiced flood-recession agriculture that depended on the natural seasonal flow of the river. Farmers cultivated rice, sorghum, onions, tomatoes, and other crops using indigenous irrigation methods adapted to local ecological conditions. These systems relied heavily on the timing, depth, and duration of annual floods. According to available historical accounts, local farmers possessed extensive knowledge of river behavior, soil fertility, and seasonal farming cycles.

However, studies indicate that local communities were largely excluded from the planning and implementation stages of the Bakolori project. Adams observes that downstream users had limited influence over dam management decisions despite their dependence on the river system [4]. Similarly, Yahaya notes that many farmers lost access to productive farmland through land acquisition processes associated with the irrigation scheme [2]. Compensation processes were reportedly inadequate, while many displaced farmers struggled to adapt to unfamiliar agricultural systems introduced by the project.

The project also altered the ecological structure of the floodplain environment. Research shows that the dam significantly reduced downstream flooding, thereby affecting traditional farming systems dependent on flood-recession agriculture [4]. The reduction in natural flooding disrupted soil fertility cycles and reduced agricultural productivity in downstream communities. Yahaya further explains that the project generated social tensions, economic hardship, and widespread dissatisfaction among affected populations [2].

Environmental studies on the Bakolori Irrigation Scheme also reveal additional ecological consequences, including salinization, waterlogging, soil degradation, and declining crop yields [10]. These outcomes demonstrate how large-scale irrigation schemes can produce unintended environmental consequences when local ecological realities are insufficiently considered during project planning and implementation.

Knowledge Hierarchies, Environmental Justice and Local Exclusion

A major concern within political ecology scholarship is the existence of knowledge hierarchies in environmental governance. Knowledge hierarchies occur when scientific and technical knowledge are treated as superior to indigenous or community knowledge. In many development projects, expert-driven planning frameworks dominate decision-making processes, while local experiences are dismissed as informal or unscientific.

The Bakolori Dam project reflects this hierarchy of knowledge. Historical accounts indicate that project planning prioritized engineering and irrigation efficiency while paying little attention to local environmental practices and downstream farming systems [4]. The absence of meaningful consultation with affected communities suggests that local knowledge was not considered relevant to development planning. As political ecology scholars argue, such exclusion often reflects broader power relations embedded within state-led environmental governance [5].

Environmental justice scholarship further explains that marginalized communities frequently bear the social and ecological costs of large infrastructure projects while receiving limited benefits. In the case of Bakolori, many local farmers experienced displacement, declining agricultural productivity, and livelihood insecurity following the implementation of the irrigation scheme [2]. These outcomes reveal how development projects framed as sustainable can reproduce inequality when local participation and indigenous knowledge are excluded.

Recent scholarship increasingly advocates inclusive environmental governance models that recognize indigenous ecological knowledge as essential for sustainable development. Environmental governance scholars argue that participatory planning improves project legitimacy, enhances local adaptation, and reduces social conflict [7]. The Bakolori case therefore remains important not only as a historical example of development failure but also as a contemporary lesson on the dangers of technocratic environmental governance that silences local knowledge systems.

Methodology

This study adopts a qualitative, comparative case study methodology to examine the tensions between technocratic environmental governance and local ecological knowledge through the case of the Bakolori Dam project in Sokoto State, Nigeria. The qualitative approach is considered appropriate because the study seeks to explore historical experiences, power relations, environmental narratives, and the lived realities of affected communities rather than generate statistical measurements. The case study design allows for an in-depth understanding of the socio-environmental consequences of the Bakolori Dam and the processes through which local ecological knowledge was marginalized within state-led development planning.

The study relies primarily on secondary sources of data, including scholarly journal articles, historical records, policy documents, government reports, archival materials, environmental studies, and documented community testimonies relating to the Bakolori Irrigation Project. The comparative dimension of the study emerges through the examination of two contrasting knowledge systems: technocratic environmental planning represented by state institutions, engineers, and modernization policies, and indigenous ecological knowledge represented by local farming communities and traditional environmental practices. Data are analyzed thematically using the lens of political ecology to identify patterns of environmental exclusion, knowledge hierarchies, ecological disruption, and community marginalization. This approach enables the study to critically assess how state-driven "green" development initiatives may reproduce environmental and social inequalities when local participation and indigenous ecological knowledge are excluded from environmental governance processes.

Result and Analysis

The findings of this study reveal that the Bakolori Dam project represents a classic example of technocratic environmental governance in which state-led modernization policies prioritized engineering efficiency and agricultural expansion over local ecological realities. Analysis of historical records and scholarly accounts indicates that the project was designed primarily around irrigation productivity targets, with little consideration for the traditional floodplain farming systems that had sustained local communities for generations. The results show that local farmers possessed extensive ecological knowledge relating to seasonal flooding patterns, soil fertility cycles, water retention, and indigenous irrigation practices. However, this knowledge was largely excluded from the planning and implementation process of the Bakolori Irrigation Scheme.

The study further reveals that the construction of the dam disrupted the ecological balance upon which local agricultural systems depended. Prior to the project, downstream communities practiced flood-recession farming that relied on the annual overflow of the Sokoto River. These seasonal floods naturally replenished soil nutrients and supported diverse agricultural activities. The introduction of the dam altered the natural hydrological cycle, significantly reducing downstream flooding and affecting agricultural productivity. Findings from the reviewed literature suggest that many local farmers experienced declining crop yields, soil degradation, and water shortages following the implementation of the project. In some areas, irrigation-related challenges such as salinization and waterlogging further reduced land productivity, undermining the very developmental objectives the project sought to achieve.

Another major finding is that the Bakolori project produced significant social and economic consequences for affected communities. The analysis indicates that many farmers lost access to fertile farmlands through land acquisition and resettlement processes associated with the irrigation scheme. Compensation mechanisms were reportedly inadequate, while displaced communities struggled to adapt to unfamiliar agricultural methods imposed through centralized irrigation planning. The findings also show that local participation in decision-making was minimal, reflecting a top-down governance structure in which affected communities had little influence over environmental planning processes. This exclusion contributed to distrust, resistance, and social tensions between local populations and state authorities.

The study additionally demonstrates the existence of knowledge hierarchies within the Bakolori Dam project. Technical and scientific expertise associated with engineers, planners, and government institutions was treated as superior to indigenous ecological knowledge. As a result, traditional environmental practices were marginalized and viewed as backward or incompatible with modernization goals. The findings suggest that this privileging of technocratic expertise contributed directly to environmental mismanagement because project planners underestimated the ecological functions of seasonal flooding and the adaptive capacities of local farming systems. In this regard, the Bakolori case illustrates how development interventions framed as "green" or sustainable can reproduce forms of exclusion when local knowledge systems are ignored.

From a political ecology perspective, the findings reveal that the Bakolori Dam was not merely a technical infrastructure project but also a political process shaped by power relations. Decisions concerning land use, water allocation, agricultural production, and environmental management were centralized within state institutions, while local communities were positioned as passive recipients of development. The project therefore reflects broader patterns within postcolonial development planning where modernization agendas often prioritize national economic goals over local environmental justice.

Overall, the analysis shows that the failure of the Bakolori Dam project cannot be understood solely in technical or economic terms. Rather, the project's limitations emerged partly from its inability to integrate indigenous ecological knowledge into environmental governance processes. The findings support contemporary arguments that sustainable development requires participatory approaches that recognize local communities as legitimate holders of environmental knowledge. The Bakolori Dam therefore stands as a cautionary example of how technocratic sustainability initiatives may unintentionally deepen environmental and social inequalities when development is pursued without meaningful local inclusion.

Recommendations

1. Environmental development projects should incorporate indigenous ecological knowledge into planning and implementation processes in order to ensure context-sensitive and sustainable outcomes.
2. Government agencies and development institutions should adopt participatory environmental governance models that actively involve local communities in decision-making, particularly in projects affecting land and water resources.
3. Future irrigation and dam projects in Nigeria should include comprehensive social and environmental impact assessments

that consider the long-term effects on local livelihoods, traditional farming systems, and ecological balance.

4. Policies should be developed to protect the rights, livelihoods, and environmental knowledge of rural communities affected by large-scale infrastructure projects through fair consultation, compensation, and inclusion mechanisms.
5. Scholars and policymakers should promote interdisciplinary approaches that combine scientific expertise with local ecological practices to achieve more inclusive and environmentally just development strategies.

Conclusion

The Bakolori Dam project illustrates the limitations of technocratic environmental governance that prioritizes engineering expertise and modernization objectives while marginalizing indigenous ecological knowledge and local participation. Although the project was introduced as a strategy for agricultural development and rural transformation, its implementation disrupted traditional floodplain farming systems, altered local ecological balances, and generated social and economic inequalities for affected communities. The study demonstrates that sustainable development cannot be achieved solely through technical infrastructure and centralized planning, especially when the knowledge and experiences of local populations are excluded. Through the lens of political ecology, the paper argues that environmental governance must move beyond top-down approaches toward more inclusive and participatory frameworks that recognize indigenous ecological knowledge as a legitimate and valuable component of sustainability. The Bakolori Dam therefore remains a significant example of how "green" development initiatives can reproduce historical patterns of marginalization when development is pursued without environmental justice and meaningful community inclusion.

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