

# Effects of Landscape Devaluation on Infrastructure and Sustainable Development in Federal Polytechnic Bali, Taraba State

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DOI: 10.56201/ijgem.vol.11.no2.2025.pg48.57

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## **Abstract**

*This study examines the effects of landscape devaluation on infrastructure and sustainable development at Federal Polytechnic Bali, Taraba State. Anchored on Environmental Determinism Theory (Ratzel, 1882), the study explores how environmental degradation impacts campus infrastructure and identifies sustainable solutions to mitigate these effects. A descriptive research design with a qualitative approach was adopted, utilizing observation as the primary data collection method. Findings reveal severe landscape degradation, including erosion, deforestation, and poor waste management, leading to damaged roads, weakened building foundations, and ineffective drainage systems. The study underscores the urgent need for landscape restoration and proactive infrastructure maintenance. Recommendations include implementing a comprehensive landscape restoration program, upgrading drainage systems, reinforcing deteriorating structures, and adopting sustainable environmental practices such as rainwater harvesting and recycling initiatives. These strategies are essential for ensuring long-term campus sustainability and improving the learning environment. The study justifies the need for proactive landscape management to preserve infrastructure and promote sustainable development.*

**Keywords:** *Landscape, Infrastructure, Degradation, Sustainability, Environment*

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## **Introduction**

The integrity of educational infrastructure is pivotal to the quality of learning and sustainable development within academic institutions. In Nigeria, numerous studies have underscored the detrimental effects of inadequate infrastructural facilities on student performance and institutional growth. For instance, John and Aliyu (2024) highlighted that deficiencies in physical resources such as classrooms, libraries, and laboratories significantly impede student learning outcomes. At the Federal Polytechnic Bali in Taraba State, the issue of landscape devaluation presents a unique challenge. Established in 2007, the institution has experienced rapid growth. However, environmental concerns, including deforestation, soil erosion, and environmental degradation, have been prevalent in Taraba State since the 1960s. These environmental challenges have the potential to adversely affect the institution's infrastructure and its commitment to sustainable development.

The relationship between environmental degradation and infrastructure deterioration is well-documented. Ezra et al. (2020) noted that climatic challenges in Taraba State, such as stunted crop growth and widespread pest infestations, are indicative of broader environmental issues that could similarly impact infrastructural integrity. Furthermore, Daudu (2016) emphasized that economic growth in Taraba State is closely linked to environmental health, suggesting that landscape devaluation could have far-reaching implications for institutional development. In the context of educational institutions, the aesthetic and functional quality of the landscape plays a crucial role in enhancing students' learning experiences. Studies have shown that well-maintained environments can restore attention, relieve stress, and improve overall academic performance. Conversely, landscape devaluation can lead to infrastructural decay, negatively affecting both the physical environment and the educational outcomes.

However, despite the completion of 22 projects by the Tertiary Education Trust Fund at Federal Polytechnic Bali, the ongoing environmental challenges necessitate a focused examination of how landscape devaluation impacts the institution's infrastructure and sustainability efforts. Understanding this relationship is essential for developing effective strategies to mitigate environmental degradation and promote sustainable development within the polytechnic.

This study aims to explore the effects of landscape devaluation on the infrastructure and sustainable development of Federal Polytechnic Bali. By employing a descriptive research design with qualitative methods, including direct observation of infrastructural conditions, the research will provide insights into the extent of environmental impact on the institution. The findings are expected to inform policy recommendations and practical interventions to enhance the resilience and sustainability of the polytechnic's infrastructure amidst environmental challenges.

### **Statement of the Problem**

Landscape devaluation has emerged as a critical issue affecting infrastructure and sustainable development at Federal Polytechnic Bali, Taraba State. The deterioration of the natural and built environment, caused by factors such as soil erosion, deforestation, poor waste management, and inadequate maintenance, poses a significant threat to the institution's infrastructure. Studies indicate that landscape degradation negatively impacts the durability of buildings, road networks, drainage systems, and green spaces (Ezra et al., 2020). However, there is limited empirical research on how these environmental challenges specifically affect the long-term sustainability of infrastructure within the polytechnic. Despite investments in infrastructural projects through initiatives like the Tertiary Education Trust Fund (TETFund) (Punch, 2018), the persistent environmental decline raises concerns about the efficiency of resource utilization, the lifespan of structures, and the overall quality of the learning environment. Poorly maintained landscapes contribute to flooding, erosion, and deterioration of roads and classrooms, affecting both staff and students. This study seeks to investigate the extent to which landscape devaluation affects infrastructure and sustainable development at Federal Polytechnic Bali, using qualitative observation methods to assess the condition of physical structures and environmental sustainability efforts. The findings will provide insights for effective infrastructural management and policy recommendations.

## **Aim and Objectives**

This study aims to examine the effects of landscape devaluation on infrastructure and sustainable development at Federal Polytechnic Bali, Taraba State. The specific objectives are:

- i. To assess the extent of landscape degradation at Federal Polytechnic Bali.
- ii. To examine the impact of landscape devaluation on campus infrastructure.
- iii. To explore sustainable strategies for mitigating infrastructure deterioration caused by environmental degradation.

## **Research Questions**

- i. What is the extent of landscape degradation at Federal Polytechnic Bali?
- ii. How does landscape devaluation impact campus infrastructure?
- iii. What sustainable strategies can mitigate infrastructure deterioration caused by environmental degradation?

## **Significance of the Study**

This study is significant to the government, community, and academia. For the government, it provides data-driven insights into the effects of landscape devaluation on infrastructure, aiding policy formulation and resource allocation for sustainable development. The local community benefits from recommendations on environmental management, fostering a healthier and more resilient ecosystem. In academia, the study expands knowledge on infrastructure sustainability, offering a reference for future research in environmental management and institutional development. By identifying practical solutions, this research supports long-term infrastructural resilience at Federal Polytechnic Bali, ensuring a conducive learning environment for students and staff.

## **Scope and Limitation**

This study focuses on the effects of landscape devaluation on infrastructure and sustainable development at Federal Polytechnic Bali, Taraba State. It examines physical structures, environmental degradation, and sustainability strategies. The limitation is its qualitative approach, relying on observation, which may lack numerical data for broader statistical generalization.

## **Conceptual review**

### **Conceptual Review of Key Variables**

This section reviews key concepts related to the study, including landscape degradation, infrastructure deterioration, sustainable development, environmental management, and institutional development. By examining scholarly perspectives, it establishes a foundation for understanding how environmental decline impacts infrastructure and sustainability at Federal Polytechnic Bali, Taraba State, while identifying strategies for mitigation.

## **Landscape Degradation**

Landscape degradation refers to the decline in the quality and functionality of the natural environment due to factors such as deforestation, soil erosion, and pollution. In Taraba State, Nigeria, environmental issues like deforestation and soil erosion have significantly impacted the region's ecological balance (Ukpo & Peter, 2016). Similarly, the Niger Delta has experienced severe environmental damage from oil spills, leading to loss of biodiversity and traditional livelihoods (Financial Times, 2023). These instances highlight the critical need for effective environmental management to prevent further landscape degradation.

## **Infrastructure Deterioration**

Infrastructure deterioration involves the gradual decline in the condition and performance of physical structures due to environmental factors and inadequate maintenance. At Federal Polytechnic Bali, despite significant investments, challenges such as lack of connection to the national electric grid persist, affecting the institution's functionality (The Guardian, 2019). Additionally, environmental degradation has been linked to infrastructure challenges, emphasizing the need for sustainable practices to maintain facility performance (Oyeyoade et al., 2019). These examples underscore the importance of addressing environmental factors to prevent infrastructure deterioration.

## **Sustainable Development**

Sustainable development aims to meet present needs without compromising the ability of future generations to meet theirs, integrating economic growth, social inclusion, and environmental protection. In Nigeria, unsustainable practices have led to environmental degradation, highlighting the need for comprehensive environmental education to promote sustainability (Nwagu, 2013). Implementing environmental impact assessments (EIAs) is crucial in infrastructure projects to ensure environmental considerations are integrated into development planning (Mondaq, 2023). These approaches are vital for achieving sustainable development in regions like Taraba State.

## **Environmental Management**

Environmental management involves the systematic approach to addressing environmental issues through policies, practices, and technologies aimed at protecting and improving the environment. In Taraba State, challenges such as deforestation and soil erosion necessitate effective environmental management strategies (IJSER, 2014). The implementation of EIAs in infrastructure development is a legal requirement in Nigeria, ensuring that environmental impacts are considered in project planning (Mondaq, 2023). These measures are essential for mitigating environmental degradation and promoting sustainable development.

## **Institutional Development**

Institutional development focuses on enhancing the capacity of organizations to achieve their missions effectively and sustainably. For educational institutions like Federal Polytechnic Bali, infrastructure development is critical for providing quality education. However, challenges such as lack of electricity and environmental degradation hinder institutional growth (The Guardian, 2019). Adopting sustainable and green management practices can improve

educational facilities' performance, thereby enhancing the learning environment (Oyeyoade et al., 2019). Strengthening institutional capacity through sustainable infrastructure is vital for long-term development.

Therefore, the interplay between landscape degradation, infrastructure deterioration, sustainable development, environmental management, and institutional development is evident in regions like Taraba State, Nigeria. Environmental challenges directly impact infrastructure quality, which in turn affects institutional performance. Implementing effective environmental management practices and sustainable development strategies is essential for mitigating these challenges. Educational institutions, such as Federal Polytechnic Bali, must prioritize sustainable infrastructure development to enhance their capacity and provide a conducive learning environment.

### **Empirical review**

Several studies have explored the relationship between environmental factors and educational infrastructure in Nigeria. Okoye, Ngwu, and Ugochukwu (2024) investigated the impact of abandoned infrastructure projects on tertiary education in Enugu, focusing on federal institutions. Their research, grounded in project management theories, utilized questionnaires distributed to 173 senior management staff of the Works Department. Findings indicated that inadequate stakeholder engagement and financial mismanagement significantly contribute to project abandonment, adversely affecting access to educational and research facilities. The authors recommend enhanced collaboration and transparent financial practices to ensure project completion. However, the study's focus on federal institutions in Enugu and reliance on management staff perspectives may limit its generalizability.

Similarly, Akpan-Idiok and Udo (2019) examined the role of landscape planning in preventing environmental degradation at Akwa Ibom State University. Employing Geographic Information System (GIS) methods, they identified critical zones requiring immediate landscape intervention. The study, based on ecological management theories, suggests implementing targeted landscape designs and regular environmental assessments to maintain ecological balance. Nonetheless, its confinement to a single university and primary reliance on GIS data may not capture all environmental variables, limiting broader applicability.

Furthermore, John and Aliyu (2023) assessed how school facilities impact student performance across Nigeria. Grounded in educational development theories, their research collected data through surveys and interviews in various states, revealing that students in schools with better physical facilities tend to perform better academically. The authors advocate for increased investment in educational infrastructure to enhance learning outcomes. However, the study's broad geographic scope may overlook region-specific challenges, and it does not account for other factors influencing academic performance, such as teacher quality or socioeconomic status.

In summary, while these studies provide valuable insights into the nexus between environmental factors and educational infrastructure, limitations such as regional focus, narrow stakeholder perspectives, and specific data collection methods highlight the need for more comprehensive research. The present study aims to address these gaps by investigating the effects of landscape devaluation on infrastructure and sustainable development at Federal

Polytechnic Bali, Taraba State, employing a holistic approach that encompasses diverse data sources and stakeholder viewpoints.

### **Therefore framework**

This study is anchored on Environmental Determinism Theory, propounded by Friedrich Ratzel in 1882. The theory asserts that environmental factors significantly influence human activities, infrastructure, and development patterns. It posits that geographical and environmental conditions shape social, economic, and infrastructural outcomes. In the context of this study, the theory is relevant because it explains how landscape devaluation affects infrastructure and sustainable development at Federal Polytechnic Bali, Taraba State. Several scholars have applied this theory in similar research areas. Diamond (1997) used it to analyse how environmental conditions determine societal progress. Meybeck et al. (2001) applied it in assessing landscape degradation's impact on water resources. Adebayo and Suleiman (2019) employed it in studying the effects of environmental deterioration on educational infrastructure in Nigerian institutions. By anchoring this study on Environmental Determinism Theory, it provides a theoretical basis for understanding how landscape devaluation influences infrastructural decline and the need for sustainable environmental management strategies.

### **Method for Data Collection**

This study employs a descriptive research design with a qualitative approach to examine the effects of landscape devaluation on infrastructure at Federal Polytechnic Bali, Taraba State. Since the study focuses on non-human participants (infrastructure), the population consists of key infrastructural units, including classrooms, hostels, administrative buildings, roads, drainage systems, and green spaces. A purposeful sampling technique is used to select these infrastructural units based on their relevance to the study. Observation serves as the primary data collection method, focusing on the condition of physical infrastructure (cracks, structural defects, and erosion damage), erosion effects on roads and pathways (degradation and accessibility issues), green spaces and their level of deterioration (due to neglect or environmental degradation), and waste management and environmental sustainability practices (evaluating their impact on campus infrastructure). This approach ensures a detailed, real-time assessment of landscape devaluation and its impact on infrastructure and sustainable development within the institution.

### **Results and Discussion**

#### *Findings for objective 1. : Extent of Landscape Degradation at Federal Polytechnic Bali*

The findings reveal that landscape degradation at Federal Polytechnic Bali is severe, affecting various infrastructural units. Observations indicate deteriorating green spaces, with overgrown vegetation, deforested areas, and soil erosion around campus facilities. For instance, areas previously designated for tree planting have become barren due to poor maintenance. Additionally, pathways and roads are heavily eroded, with visible gullies caused by unchecked rainwater runoff. In many locations, drainage systems are clogged with waste, leading to water stagnation and further soil erosion. The campus environment has lost its aesthetic value, affecting students' well-being and the overall learning atmosphere. A prime example is the main administrative building's surroundings, where the once well-maintained lawn has turned



into patches of dry, eroded soil. These findings illustrate that the campus landscape is progressively deteriorating, highlighting the urgent need for sustainable interventions to restore greenery and prevent further degradation.

#### *Findings for objective 2.: Impact of Landscape Devaluation on Campus Infrastructure*

Landscape devaluation has significantly affected campus infrastructure, leading to building deterioration, damaged roads, and increased maintenance costs. Several classroom blocks, including those in Engineering and Business Studies faculties, exhibit cracks and foundation weaknesses due to soil erosion. For instance, a lecture hall near the school library has developed deep structural cracks, making it unsafe for use. Furthermore, eroded roads and pathways have become hazardous, especially during the rainy season, with water pooling in low-lying areas, making access difficult. Drainage systems are ineffective, as waste accumulation blocks water flow, resulting in frequent flooding around hostels and lecture halls. Additionally, poor landscape management has led to increased dust pollution, negatively impacting both students' and staff members' health. These observations suggest that landscape devaluation is a major contributor to the deterioration of campus infrastructure, reinforcing the need for immediate restoration efforts to prevent further infrastructural damage.

#### *Findings for objective 3. Sustainable Strategies for Mitigating Infrastructure Deterioration*

To address these challenges, the study identifies sustainable strategies that can help restore the campus landscape and protect infrastructure. One key recommendation is the implementation of an integrated landscape management plan, including tree planting, erosion control measures, and improved waste disposal practices. For instance, introducing rainwater harvesting systems can help reduce water runoff and soil erosion. Additionally, establishing green belts around administrative and academic buildings can help prevent soil degradation while enhancing the campus environment. Another critical strategy is routine maintenance of drainage systems, ensuring that waste does not block water flow. Community involvement through student environmental clubs and partnerships with government agencies can also foster a culture of sustainability on campus. For example, a waste recycling initiative can minimize environmental pollution while promoting awareness. Overall, these findings highlight that a proactive and sustainable approach is essential to mitigating infrastructure deterioration and ensuring the long-term viability of Federal Polytechnic Bali's landscape.

### **Conclusion**

This study highlights the significant effects of landscape devaluation on infrastructure and sustainable development at Federal Polytechnic Bali, Taraba State. Findings reveal that environmental degradation, poor landscape management, and erosion have led to deteriorating infrastructure, including damaged roads, weakened building foundations, and clogged drainage systems. These issues not only affect the institution's aesthetic appeal but also compromise safety, accessibility, and long-term sustainability. The study underscores the need for sustainable strategies such as tree planting, erosion control, improved waste management, and regular infrastructure maintenance to mitigate deterioration and restore the campus environment. Implementing these strategies will enhance the physical condition of the Polytechnic, improve the learning environment, and promote sustainable development. Ultimately, this study justifies the urgency of proactive landscape management to preserve

infrastructure and ensure a conducive academic setting for current and future students at Federal Polytechnic Bali.

### **Recommendations:**

- i. To address landscape degradation at Federal Polytechnic Bali, the institution should implement a comprehensive landscape restoration program, including tree planting, erosion control measures, and regular maintenance of green spaces.
- ii. To mitigate the negative impact of landscape devaluation on campus infrastructure, the Polytechnic should establish a proactive maintenance plan, focusing on road repairs, drainage system upgrades, and structural reinforcements for deteriorating buildings.
- iii. To promote sustainable infrastructure management, the institution should adopt eco-friendly initiatives, such as rainwater harvesting, waste recycling programs, and community-led environmental awareness campaigns, to ensure long-term campus sustainability.

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