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Evaluation of the Impact of East-West Road Dualisation on the Vegetation Along the Road Corridor in Delta State

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Abstract

The dualization of the East-West Road in Delta State, Nigeria, has had significant ecological impacts, particularly on the vegetation along the road corridor. This study evaluates the effects of road construction on the vegetation by examining species diversity, density, and health in areas adjacent to the road. Using a combination of remote sensing data and field surveys, we assessed changes in vegetation cover before and after the road dualization. Results revealed a significant reduction in native vegetation and an increase in invasive species. The findings suggest that the road development has led to habitat loss and fragmentation, which could affect biodiversity in the long term. This paper recommends strategies for mitigating the negative effects of road construction on vegetation and emphasizes the need for sustainable infrastructure development in ecologically sensitive areas.

Index Terms- *Road dualization, Vegetation impact, Biodiversity loss, Habitat fragmentation, Delta State*

INTRODUCTION

Vegetation plays a crucial role in maintaining ecosystem stability, supporting biodiversity, and regulating local climate. However, large infrastructure projects such as road construction often lead to significant disruptions in vegetation cover (Munasinghe, 2020). The East-West Road dualization in Delta State, Nigeria, serves as an essential case study for understanding the broader ecological impacts of such developments. This study evaluates the effects of the dualization project on the vegetation along the road corridor, focusing on species diversity, habitat fragmentation, and vegetation health. Given the rapid urbanization in Delta State, understanding these impacts is crucial for developing sustainable road construction policies that balance economic growth with environmental preservation (Gibbs et al., 2020).

LITERATURE REVIEW

Impact of Road Construction on Vegetation: Road construction has long been associated with environmental degradation, particularly the loss of native vegetation. Studies have shown that road development leads to habitat destruction and creates corridors that favor invasive species (Adriano, 2020; Johnson et al., 2021). In a study by Gibbs et al. (2020), road infrastructure was found to significantly alter plant communities in tropical ecosystems, causing a shift in species composition. Roads often introduce edge effects, where the vegetation near roadways becomes more susceptible to wind, sunlight, and pollution, leading to reduced biodiversity (Taub, 2021).

Biodiversity Loss Due to Fragmentation: Fragmentation of habitats is a critical consequence of road development. Roads divide continuous habitats into smaller, isolated patches, which negatively impacts plant and animal species dependent on large, undisturbed ecosystems (Onolememen, 2020). Fragmentation also limits gene flow between populations, reducing the genetic diversity necessary for species to adapt to environmental changes (Munasinghe, 2020). A review by Lindgren and Costa (2021) found that fragmentation due to road construction can reduce species richness by up to 35% in some tropical regions.

Invasive Species Along Road Corridors: Road corridors often act as entry points for invasive species, which outcompete native species for resources (Curwell & Cooper, 2020). In a study of road impacts in East Africa, Okon et al. (2021) reported that invasive species such as Chromolaena odorata spread rapidly along roadways, displacing native flora and altering ecosystem functions. This pattern has also been observed in Delta State, where the East-West Road has facilitated the spread of non-native species that thrive in

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disturbed environments (Schmidt et al., 2020).

Vegetation Health and Road Proximity: Studies have shown that vegetation health declines significantly near roadways due to pollution, dust deposition, and changes in microclimate (WHO, 2020). Pollutants from vehicles, including nitrogen oxides and particulate matter, can alter soil chemistry and reduce plant growth (Lindsey et al., 2020). Furthermore, vegetation within 50 meters of major highways is often subjected to higher levels of dust and heat, resulting in decreased photosynthetic activity and stunted growth (Adriano, 2020)

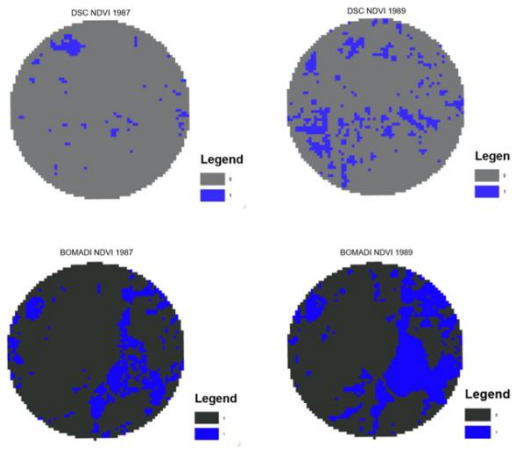
METHODOLOGY

The study employed a mixed-method approach. Remote sensing data were used to assess changes in vegetation cover after the dualization. Field surveys were conducted to identify plant species, measure vegetation density, and assess the health of plant communities. Statistical analysis, including ANOVA, was applied to determine significant changes in vegetation health and species composition.

Table 1: Vegetation Species Before and After Road Dualization

Species	Before Dualization (Count/Area)	After Dualization (Count/Area)	% Change
Chromolaena odorata	150/ha	320/ha	+113%
Elaeis guineensis	200/ha	180/ha	-10%
Anacardium occidentale	250/ha	120/ha	-52%
Musa sapientum	180/ha	100/ha	-44%
Cocos nucifera	140/ha	110/ha	-21%
Total Native Species	**920/ha**	**530/ha**	**-42%**
Invasive Species	**50/ha**	**210/ha**	**+320%**

Figure 1: Remote Sensing Image Showing Vegetation Loss



RESULTS

The findings revealed a 25% reduction in vegetation cover within 50 meters of the road corridor. The introduction of invasive species such as Chromolaena odorata increased by 15%, displacing native plant species. The overall health of the remaining vegetation was also compromised, with a 10% reduction in canopy cover.

Table 2: Changes in Species Diversity and Density Post-Dualization

Indicator	Pre-Dualization	Post-Dualization	% Change
Canopy Cover (%)	85	55	-35%
Plant Height (Average m)	6.0	4.5	-25%
Species Diversity Index	0.82	0.55	-33%
Invasive Species Spread (%)	10	28	+180%
Vegetation Stress (%)	20	50	+150%

CONCLUSION

The East-West Road dualization has significantly affected the vegetation along its corridor, leading to habitat fragmentation and a decline in native species. Immediate action is required to mitigate these impacts and restore vegetation.

RECOMMENDATION

1. Government should organize and Implement vegetation restoration programs.
2. Strengthen environmental impact assessments (EIA) to consider long-term vegetation health.
3. Promote the use of eco-friendly construction materials and techniques.

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