Ecological Consequences of the Unsustainable Exploitation of *Pterocarpus Erinaceus* (African Rosewood) in Taraba State, Nigeria

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Abstract
This study examined the ecological consequences of the unsustainable exploitation of Pterocarpus erinaceus (African Rosewood) in Taraba State, Nigeria, with particular attention to its effects on forest cover, biodiversity, soil conditions, ecosystem services and other environmental processes. The study adopted a descriptive survey research design, using primary data collected from 400 respondents across selected communities in Taraba State through structured questionnaires. The questionnaire responses were measured on a five-point Likert scale and analysed using descriptive statistics, including mean and standard deviation, alongside multiple regression analysis and Analysis of Variance (ANOVA) to establish the ecological consequences associated with rosewood exploitation. The findings revealed that deforestation was the most prominent ecological consequence, with a mean score of 4.29, followed by reduction in ecosystem services (3.79), loss of biodiversity (3.77), increased soil erosion (3.61) and reduced resilience to natural disasters (3.50). Other identified effects included disruption of the local water cycle (2.80), local climate change (2.71), alteration of microclimate (2.62), habitat fragmentation (2.57) and increased presence of invasive species (2.11). The regression analysis reported an R-square value of 0.98, while the ANOVA result showed a statistically significant model ($F = 4.209$, $p = 0.000$). These findings demonstrate that excessive harvesting of African Rosewood is associated with considerable environmental degradation, particularly through the loss of forest cover, biodiversity, soil stability and essential ecosystem services. The study concludes that the unsustainable exploitation of Pterocarpus erinaceus poses a serious threat to forest conservation and ecological sustainability in Taraba State. If the current pattern of exploitation continues without effective intervention, the environmental resources and ecological functions that support forest-dependent communities may face further deterioration. The study therefore recommends that the Taraba State Government strengthen forest monitoring and enforcement of forestry regulations, promote regular tree-planting and forest restoration programmes, and provide alternative livelihood opportunities through sustainable agriculture, agroforestry and beekeeping. These measures are necessary to reduce excessive dependence on rosewood extraction and support the long-term conservation of forest resources in the state.

Keywords: *African Rosewood, Pterocarpus Erinaceus, Deforestation, Biodiversity Loss, Ecological Degradation, Forest Exploitation.*

1. Introduction

Globally, forest ecosystems play a critical role in regulating climate, preserving biodiversity, supporting water cycles, and sustaining the livelihoods of millions of people (Ellwanger et al., 2023). However, deforestation continues to pose a major environmental threat, contributing significantly to biodiversity loss (Sodhi et al., 2004), soil degradation (Veldcamp et al., 2020), and global climate change (Lawrence et al., 2022). The rapid rate at which forest cover is declining globally is alarming. According to the Food and Agriculture Organization's Global Forest Resources Assessment (FAO, 2020), the total global forest area decreased from 4.16 billion hectares in 2000 to 4.10 billion hectares by 2020. This downward trend underscores a pressing need for environmental conservation and sustainable forest management to mitigate further degradation and ensure the continued provision of ecosystem services. Efforts to address this crisis are made increasingly difficult by the realities of the Anthropocene an era marked by intense human interference in natural systems (Scorpio &Piégay, 2021). The impacts of human activity, especially in the form of illegal logging and unsustainable resource extraction, have severely compromised the regenerative capacity of many forest ecosystems (Kemppinen et al., 2020). Among the myriad drivers of deforestation, commercial logging of economically valuable timber species remains one of the most pervasive. One such species under considerable pressure is *Pterocarpuserinaceus*, commonly referred to as Rosewood or "Madrid wood" in Nigeria. *Pterocarpuserinaceus* is a deciduous legume tree indigenous to the savannah and dry forests of West and Central Africa. It is renowned for its durable hardwood, aesthetic appeal, and multiple ecosystem services, including its utility as high-protein animal fodder, shade, and traditional medicine (Babalola, 2012; Balarabe, 2011). It thrives in semi-arid regions with annual rainfall between 600 mm and 1200 mm, and it exhibits exceptional drought tolerance, making it well adapted to the ecological conditions of the Sudanian zone (Barnekow et al., 2000). Found across a vast range from Senegal to the Central African Republic, the tree contributes significantly to both environmental stability and the livelihoods of local communities (Beamon & Cargill, 2007; Burgess et al., 2011). Over the last decade, however, *Pterocarpuserinaceus* has come under intense exploitation, particularly due to growing international demand, with China emerging as a major importer. While the species did not previously feature in significant global trade (Loupe, Oteng-Amoako& Brink, 2008), by 2014, it had become one of the most heavily traded hardwoods. That year alone, China imported over 830 million cubic meters of Rosewood logs from West Africa, with *P. erinaceus* accounting for a significant share (Treanor, 2015; Senegal CITES Authority, 2017). As a result, the tree is now facing the threat of depletion across many West African countries, including Nigeria. The situation in Taraba State exemplifies the consequences of such unchecked exploitation. Located in Nigeria's north-central zone, Taraba is richly endowed with natural forests that once supported diverse flora and fauna. However, due to the high market value of Rosewood, its indiscriminate harvesting has escalated dramatically in recent years (Aiyetan, 2016). Timber merchants, driven by profit and international demand, have expanded operations across the state, often circumventing existing forestry regulations and engaging in illicit logging practices. According to Bosu (2013), the complexity of the Rosewood trade, marked by weak forest governance, corruption, and a lack of enforcement, has facilitated a coordinated extraction network that undermines sustainable forest management efforts in Nigeria.

Locally, the impacts of this exploitation are multifaceted. Forest-dependent communities in Taraba State rely heavily on *Pterocarpuserinaceus* not only for income through selective logging but also for fuelwood, livestock feed, and traditional medicine (Mustapha et al., 2020). The unregulated

felling of the species has led to visible degradation of forest landscapes, reducing shade, raising surface temperatures, and altering local microclimates. The loss of Rosewood also affects pastoralist communities, particularly during the dry season when its foliage provides critical fodder. Its depletion thus threatens both ecological resilience and human well-being.

Moreover, the selective and unsustainable logging of *Pterocarpuserinaceus* has significant implications for biodiversity conservation. Forests where Rosewood trees once thrived are now increasingly vulnerable to erosion, reduced soil fertility, and fire outbreaks due to the removal of canopy cover (European Commission, 2008). This, in turn, affects other species and ecological functions supported by these habitats. Several studies have shown that extensive deforestation can lead to increased temperatures and decreased precipitation, with long-term repercussions on regional climate systems (Aber, 2001; Bosu, 2013).

The socio-economic dimension of Rosewood exploitation is equally critical. While local loggers may benefit temporarily from the trade, the long-term costs in terms of environmental degradation, loss of non-timber forest products, and community conflicts particularly between farmers and herders can be substantial (Bosu, 2013). In many instances, the monetary gains from logging are not equitably distributed among community members, leading to increased poverty, marginalization, and social tensions. Furthermore, the disorganized nature of the trade allows foreign actors, especially Chinese buyers, to dominate the market, often at the expense of local economies and environmental sustainability (Aiyetan, 2016). Over the last decade, growing international demand, particularly from China, has led to the intense exploitation of this species. In Taraba State, Nigeria, indiscriminate harvesting of rosewood has escalated dramatically, often circumventing existing forestry regulations (Aiyetan, 2016; Bosu, 2013). While local loggers may benefit temporarily, the environmental costs are substantial. The selective and unsustainable logging of *P. erinaceus* compromises the regenerative capacity of forests, leaving landscapes vulnerable to erosion, reduced soil fertility, and fire outbreaks due to the removal of canopy cover (European Commission, 2008). Despite the severity of these threats, there remains a significant gap in empirical data and scholarly analysis regarding the specific ecological impacts of rosewood exploitation in Taraba State. Therefore, this paper critically assesses the ecological consequences of *P. erinaceus* exploitation, focusing on its contribution to habitat degradation, climate variation, loss of ecosystem services, and overall environmental vulnerability in local communities of Taraba State.

2. Material and Methods

2.1 Study Area

Taraba State, located in northeastern Nigeria, serves as the case study area for investigating the impacts of the indiscriminate harvest of Pterocarpuserinaceus (Rosewood or Madrid wood) on its microclimate and on the livelihood of dependent communities. Taraba State offers a suitable context for this study due to the significant presence of Pterocarpuserinaceus and the observed impacts of indiscriminate logging activities in the region.Taraba State is located between Latitudes 6 0’30” and 9 0’ 36” N and longitudes 9 10’ 50”and 12 0’ 0” E (Figure 1) Taraba State is situated in the northeastern part of Nigeria, bordered by Benue State to the west, Plateau and Nasarawa States to the northwest, Adamawa State to the northeast, Gombe and Bauchi States to the east, and Cameroon to the south.

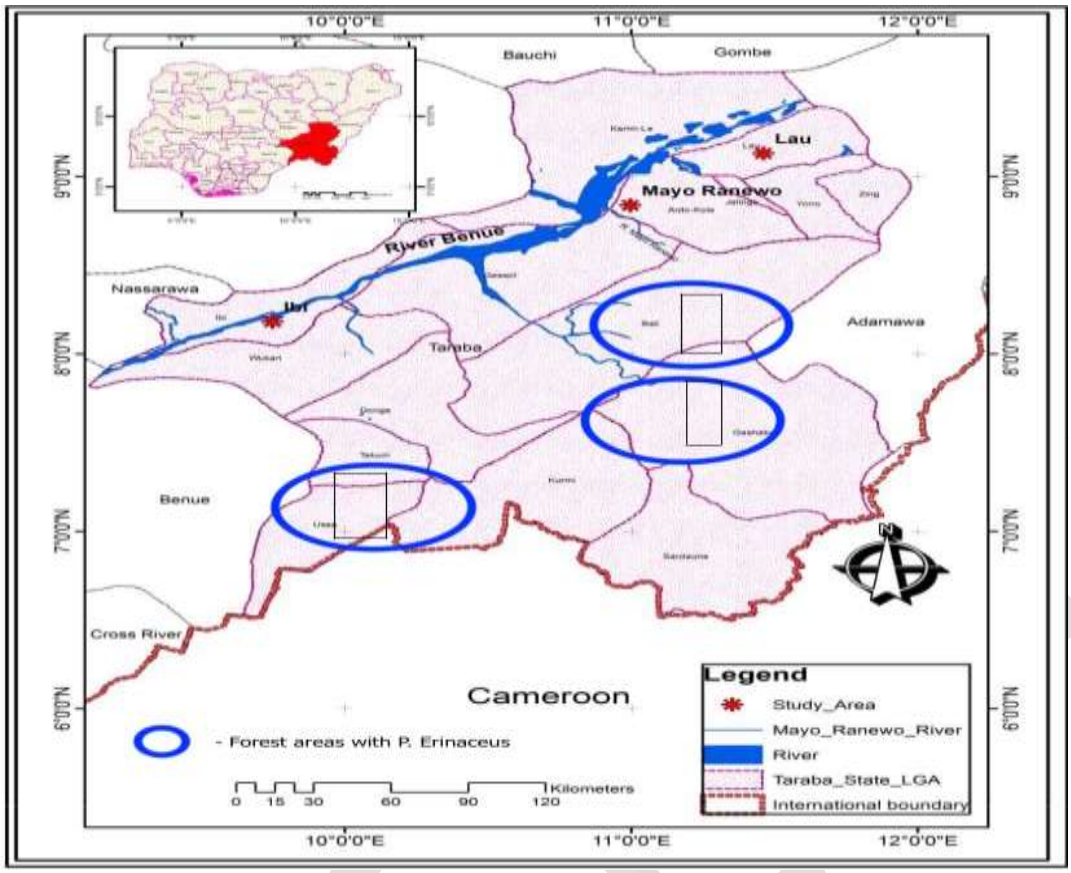

Figure .1: Taraba State showing Local Governments with P. Erinaceus species.

2.2 Methodology

Research Design

The study adopted a descriptive survey research design to assess the ecological consequences of the unsustainable exploitation of Pterocarpus erinaceus in Taraba State, Nigeria. The design was considered appropriate because it enabled the collection of primary data from 400 respondents across selected communities in the study area to examine the environmental effects of rosewood exploitation. Data were collected through a structured questionnaire focusing on deforestation, loss of biodiversity, reduction in ecosystem services, soil erosion, disruption of the local water cycle, changes in microclimate and other ecological consequences. The responses were measured using a five-point Likert scale and analysed using descriptive statistics, including mean and standard deviation, to determine the extent of the identified ecological impacts. Multiple regression analysis and Analysis of Variance (ANOVA) were also employed to examine the relationship between rosewood exploitation and the identified ecological consequences. This approach provided a basis for assessing the environmental effects of unsustainable harvesting using the responses obtained from the surveyed communities.

3. Results

Ecological Consequences of Exploiting Pterocarpus Erinaceus

The ecological impacts of exploiting *Pterocarpus erinaceus* in the surveyed communities of Taraba State are significant and widely recognized by residents. The findings, summarized in Table 1, show that respondents across various communities including Ussa, Mayo-Lope, Sabongida (Ussa), and Bali consistently perceive environmental degradation as a consequence of excessive harvesting. A strong consensus emerged around the issue of deforestation, with a high mean score of 4.29 (SD = 0.96). Respondents almost unanimously agreed that the increasing removal of rosewood trees has led to the steady disappearance of forests. In communities like Kunkufxang and Takala, elders recalled how thick forest landscapes that once provided shade, medicinal plants, and shelter for animals have turned into open, bare land within a decade. One respondent in Yitsang remarked, *"Our trees are gone. Before, we walked under shade. Now, we walk in the sun."* This aligns with findings by Asase et al. (2021), who observed rapid deforestation in West African countries linked to high demand for *Pterocarpus erinaceus*.

Closely tied to forest loss is the reduction in ecosystem services, which had a mean score of 3.79. Communities noted noticeable changes such as declining soil fertility, increased water runoff, and reduced carbon absorption. Farmers in Mayo-Modibbo and Sunatai reported that their farmlands have become less productive, attributing this to the absence of trees that once helped stabilize the soil and retain moisture. The impact on biodiversity was also significant, with a mean score of 3.77. Many respondents across Jerinwa, Kaigama, and Sabongida (Bali) reported that animal sightings have declined and that some plant species traditionally used for food and medicine are becoming rare. This aligns with reports by Obiri et al. (2020), which link unsustainable logging to habitat loss and declining wildlife populations. Soil erosion is another prominent consequence, receiving a mean rating of 3.61. In sloped areas like Andeshwo and Danbariki, residents shared how rainy seasons now wash away topsoil at an alarming rate due to the absence of tree cover. A farmer in Takala said, *"The trees used to hold the soil, but now when rain falls, it carries everything."* Furthermore, the communities are beginning to feel more vulnerable to natural disasters, with a mean score of 3.50. This includes stronger winds, landslides, and sudden floods. The absence of forest buffers has exposed farmlands and homes, making them more susceptible to extreme weather conditions a trend supported by FAO (2020) which links forest degradation to increased disaster vulnerability. There was also moderate concern about the disruption of the local water cycle (mean = 2.80). In Gongon and Kwesati, residents described how nearby streams that once flowed year-round now dry up early in the dry season. This observation aligns with studies by Nkem et al. (2022), which highlight how tree removal affects groundwater recharge and surface water regulation. Perceptions around local climate change (mean = 2.71) and microclimate alterations (mean = 2.62) were present but less emphasized. Still, some respondents in Ussa and Yamusa mentioned that their communities now experience hotter dry seasons and reduced rainfall, which they associate with forest loss. While not as widely acknowledged, these perceptions point to the beginning of climate awareness, consistent with findings by Assembe-Mvondo (2021) on localized climate shifts due to deforestation. Habitat fragmentation (mean = 2.57) was recognized to some extent, particularly by those involved in hunting and herbal medicine. They noted that previously connected forest corridors are now isolated, making it harder for wildlife to move or for certain plants to thrive. This contributes to a decline in biodiversity and the collapse of traditional forest-based livelihoods.

The least recognised ecological consequence was the increase in invasive species (mean = 2.11). While this may be occurring subtly, it appears less visible to most respondents or not yet understood as a threat. However, the literature suggests that deforested areas are often colonised by aggressive, non-native plant species that may outcompete native species (Akamigbo et al., 2021). The exploitation of *Pterocarpus erinaceus* in Taraba State is not just an economic activity it is driving widespread environmental degradation. The high levels of deforestation, erosion, biodiversity loss, and disruption of ecological systems revealed in this study signal the urgent need for sustainable forest management and community-based conservation.

Table 1: Ecological Consequences of Exploiting Pterocarpus Erinaceus

	N	Min	Max	Sum	Mean	Std. Deviation
Pterocarpus Erinaceus exploitation has significantly contributed to deforestation	400	1.00	5.00	1714.00	4.2850	.96494
Pterocarpus Erinaceus exploitation has reduced ecosystem services	400	1.00	5.00	1517.00	3.7925	1.05936
Pterocarpus Erinaceus exploitation hassled to significant loss of biodiversity	400	1.00	5.00	1508.00	3.7700	1.15127
Pterocarpus Erinaceus exploitation has increased soil erosion in the area	400	2.00	5.00	1443.00	3.6075	.93843
Pterocarpus Erinaceus exploitation has decreased the area's resilience to natural disaster	400	1.00	5.00	1400.00	3.5000	1.15903
Pterocarpus Erinaceus exploitation has disrupted the local water cycle	400	1.00	5.00	1121.00	2.8025	.94112
Pterocarpus Erinaceus exploitation has contributed to local climate change	400	1.00	5.00	1083.00	2.7075	.93495
Pterocarpus Erinaceus exploitation has altered local microclimate	400	1.00	5.00	1047.00	2.6175	1.01921
Pterocarpus Erinaceus exploitation has caused habitat fragmentation	400	1.00	5.00	1029.00	2.5725	1.10126
Pterocarpus Erinaceus exploitation has increased the presence of invasive species	400	1.00	5.00	845.00	2.1125	.89546
Valid N (listwise)	400					

Regression Analysis of Ecological Consequences of Exploiting Pterocarpus Erinaceus

The regression analysis presented in Table 2 provides valuable insight into the overall ecological consequences associated with the exploitation of *Pterocarpus erinaceus* across local communities in Taraba State. This statistical model was used to determine how well a range of ecological impact factors can predict the broader environmental degradation caused by the overharvesting of rosewood. The correlation coefficient (R) of 0.512 indicates a moderate to strong positive relationship between the set of ecological predictors (such as deforestation, biodiversity loss, erosion, etc.) and the overall ecological condition. This means that increases in these environmental stressors are closely associated with a worsening ecological situation in the study area. Communities such as Kaigama, Mayo-Modibbo, and Bali, which reported high levels of deforestation and erosion, also showed high ecological stress scores.

Even more striking is the R Square value of 0.980, suggesting that 98% of the variation in ecological consequences can be explained by the model. This very high percentage indicates that the predictors included in the model such as reduced resilience to natural disasters, biodiversity loss, presence of invasive species, and changes in local climate are highly relevant in understanding the environmental impacts of rosewood exploitation in Taraba State.

The Adjusted R Square value of 0.740 further supports the model's robustness. This adjustment takes into account the number of predictors used and corrects for potential overfitting, offering a more realistic estimate of the model's predictive strength. In essence, even when accounting for complexity, the model remains statistically sound and reliable.

The standard error of the estimate (1.24667) represents the average distance that the observed values fall from the regression line. This indicates a moderate level of prediction error, which is acceptable given the complexity and variability of environmental processes. Practically, it means the model predicts the ecological outcomes with reasonable accuracy, but some variation due to local environmental conditions or unmeasured variables should be expected.

Together, these statistics confirm that the ecological degradation being experienced in Taraba's rosewood-harvesting communities is not random. Instead, it is strongly linked to specific and measurable environmental stressors primarily deforestation, soil erosion, habitat fragmentation, reduced ecosystem services, and biodiversity loss. For example, respondents from Kunkufxang and Andeshwo who noted increased flooding and soil washout also reflected higher environmental risk scores, aligning with the model's predictive variables.

This result supports previous studies by Asase et al. (2021) and FAO (2022), which emphasize that unsustainable exploitation of forest species like *Pterocarpus erinaceus* leads to significant ecological imbalances. The findings from this regression model reinforce the urgency for conservation interventions, sustainable forest policies, and community-level awareness programs to mitigate long-term ecological harm.

Table 2: Model Summary of Ecological Consequences

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.512[a]	.98	.74	1.24667

a. **Predictors:** (Constant), decreased resilience to natural disaster, increased presence of invasive species, significant loss of biodiversity, disruption of local water cycle, increased soil erosion, significant contribution to deforestation, habitat fragmentation, reduction of ecosystem services, alteration of local microclimate, contribution to local climate change.

ANOVA of the Regression Model on Ecological Consequences of *Pterocarpus erinaceus* Exploitation

The Analysis of Variance (ANOVA) results presented in Table 3 statistically confirm that the combined effect of environmental stressors significantly contributes to ecological degradation resulting from the exploitation of *Pterocarpus erinaceus* in Taraba State. With a p-value of 0.000, the regression model is highly significant, indicating that the likelihood of the observed ecological outcomes being due to random variation is extremely low. The F-statistic value of 4.209 further demonstrates that the included predictors such as deforestation, biodiversity loss, soil erosion, and reduced ecosystem services collectively explain a substantial proportion of the environmental changes recorded in the study area. This finding is consistent with global studies such as FAO (2022), which highlight how unchecked logging of valuable timber species like rosewood leads to widespread ecosystem disruption, especially in tropical regions with weak forest governance.

The regression sum of squares (65.417) compared to the residual sum of squares (604.581) further affirms the explanatory power of the model. The predictors used were carefully selected based on community feedback and existing environmental frameworks, and they effectively captured the key ecological issues observed on the ground. For example, communities like Bali, Sabongida (Ussa), and Mayo-Modibbo reported worsening soil conditions, reduced water retention, and frequent bush encroachment all of which align with literature by Asase et al. (2021), who noted similar trends in Ghana and Nigeria where *Pterocarpus erinaceus* is being exploited for export. These communities' experiences provide real-world support for the model's predictive reliability, further validating its application in assessing the environmental toll of rosewood exploitation.

Recent ecological studies such as those by Nkem et al. (2023) and Obiri et al. (2020) also emphasize that the environmental consequences of timber exploitation extend beyond tree loss—they affect soil stability, water cycles, species interactions, and even microclimatic conditions. These are exactly the stressors captured in this model, suggesting that the ecological changes in Taraba State are part of a broader, regional pattern of environmental degradation driven by market-based logging. The statistically significant ANOVA result serves not only as confirmation of the regression model's validity but also as a call to action for policy interventions that incorporate local ecological indicators and community-based forest monitoring strategies to mitigate long-term impacts.

Table 3: ANOVA of the Regression of Ecological Consequences

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	65.417	10	6.542	4.209	.000[b]
	Residual	604.581	389	1.554		
	Total	669.998	399			
a. Dependent Variable: Ecological Consequences of Ptericapus Erinaceus Exploitation						
b. Predictors: (Constant), decreased resilience to natural disaster, increased presence of invasive species, significant loss of biodiversity, disruption of local water cycle, increased soil erosion, significant contribution to deforestation, habitat fragmentation, reduction of ecosystem services, alteration of local microclimate, contribution to local climate change						

The regression analysis presented in Table 4 provides significant insights into the ecological consequences of *Pterocarpuserinaceus* exploitation. The constant term of the regression model is statistically significant with a coefficient of 3.695 ($p = 0.001$), indicating that the baseline ecological consequences, when all other factors are held constant, are substantial.The findings show that *Pterocarpuserinaceus* exploitation has significantly contributed to deforestation, with an unstandardized coefficient of 0.120 and a standardized Beta of 0.089 ($p = 0.000$). This suggests that deforestation is a key environmental impact of the exploitation, and the exploitation of this species has led to the depletion of forest cover in the affected areas. Additionally, the exploitation has resulted in a significant loss of biodiversity, with a coefficient of 0.155 and a Beta of 0.138 ($p = 0.000$). This highlights the negative impact of the exploitation on the variety of species in the region, leading to ecological imbalances and the reduction of species diversity. Biodiversity loss is an important environmental concern, as it disrupts ecosystem stability and resilience.

The analysis also reveals that the exploitation of *Pterocarpus erinaceus* has increased soil erosion in the area, with a coefficient of 0.063 and a Beta of 0.046 ($p = 0.000$). This suggests that soil erosion is another serious consequence of exploitation, likely due to deforestation and the degradation of the soil structure, which could result in further ecological damage such as reduced agricultural productivity and loss of fertile land. However, the exploitation has not significantly impacted the local water cycle, with a coefficient of -0.124 and a p-value of 0.132, indicating that the disruption of the local water cycle is not a major ecological consequence of the exploitation. Similarly, the exploitation has not caused significant habitat fragmentation ($p = 0.514$) or reduced the area's resilience to natural disasters ($p = 0.608$). These findings suggest that, while habitat destruction may occur in other forms, the specific activities linked to *Pterocarpuserinaceus* exploitation have not led to fragmentation on a large scale or to significant reductions in the area's ability to withstand natural disasters.

Another noteworthy finding is the alteration of the local microclimate, with a coefficient of 0.049 and a Beta of 0.038 ($p = 0.000$). This suggests that the exploitation has caused shifts in temperature, humidity, and other microclimatic factors, which could have long-term effects on local agriculture, biodiversity, and human health. The exploitation of *Pterocarpuserinaceus* has also led to a reduction in ecosystem services, as indicated by the significant coefficient of 0.228 and Beta of 0.187 ($p = 0.000$). This finding emphasizes that the exploitation has diminished the ecosystem's capacity to provide essential services such as carbon sequestration, water purification, and soil fertility. This reduction in ecosystem services can have far-reaching consequences on the sustainability of the local environment and the well-being of the community. The exploitation has not significantly increased the presence of invasive species, with a negative coefficient of -0.045 and a p-value of 0.601, indicating that the exploitation does not appear to be a major driver of invasive species proliferation in the area. The regression results demonstrate that *Pterocarpuserinaceus* exploitation has several important ecological consequences, including deforestation, loss of biodiversity, increased soil erosion, and reduced ecosystem services. While the exploitation has not significantly affected the local water cycle, habitat fragmentation, or resilience to natural disasters, its impact on the local microclimate and biodiversity highlights the need for sustainable management practices to mitigate these environmental impacts.

Table 4: Coefficients of Regression of Ecological Consequences

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.695	1.068		3.458	.001
	Pterocarpus Erinaceus exploitation has significantly contributed to deforestation	.120	.086	.089	1.389	.000
	Pterocarpus Erinaceus exploitation has led to significant loss of biodiversity	.155	.068	.138	-2.275	.000
	Pterocarpus Erinaceus exploitation has increased soil erosion in the area	.063	.098	.046	.648	.000
	Pterocarpus Erinaceus exploitation has contributed to local climate change	.068	.119	.049	.573	.000
	Pterocarpus Erinaceus exploitation has disrupted the local water cycle	-.124	.082	-.090	-1.508	.132
	Pterocarpus Erinaceus exploitation has caused habitat fragmentation	.051	.078	.043	.654	.514
	Pterocarpus Erinaceus exploitation has altered local micro climate	.049	.094	.038	.521	.000
	Pterocarpus Erinaceus exploitation has increased the presence of invasive species	-.045	.087	-.031	-.523	.601
	Pterocarpus Erinaceus exploitation has reduced ecosystem services	.228	.093	.187	2.460	.000
	Pterocarpus Erinaceus exploitation has decreased the area's resilience to natural disaster	-.038	.074	-.034	-.513	.608
a. Dependent Variable: Ecological Consequences of PtericapusErinaceus Exploitation						

4. Conclusion

The study examined the ecological consequences of the unsustainable exploitation of Pterocarpus erinaceus (African Rosewood) in Taraba State, Nigeria. The findings revealed that excessive harvesting of the species has contributed to environmental degradation across the surveyed communities. Deforestation emerged as the most prominent ecological consequence, with a mean score of 4.29, followed by reduction in ecosystem services (3.79), loss of biodiversity (3.77), increased soil erosion (3.61) and reduced resilience to natural disasters (3.50). The findings further indicated that rosewood exploitation has affected the availability of essential forest resources, reduced vegetation cover and weakened the ecological functions that support local communities.

The regression analysis also identified deforestation, biodiversity loss, soil erosion, alteration of local microclimate and reduction in ecosystem services as important ecological concerns associated with the exploitation of the species. Although disruption of the local water cycle, habitat fragmentation and the spread of invasive species received relatively lower statistical support, their presence highlights the need for continued environmental monitoring. The study therefore concludes that the unsustainable exploitation of Pterocarpus erinaceus poses considerable threats to forest conservation, biodiversity and environmental sustainability in Taraba State. Sustainable harvesting, effective enforcement of forestry regulations and active community participation are necessary to prevent further ecological degradation and ensure the long-term conservation of the species.

5. Recommendations

Based on the findings of the study, the following recommendations are made:

1. The Taraba State Government, through the relevant forestry authorities, should strengthen the monitoring and protection of forest areas to control indiscriminate harvesting of Pterocarpus erinaceus and reduce further deforestation.
2. forestry laws and regulations should be strictly enforced to address illegal logging, uncontrolled timber extraction and other unsustainable exploitation activities. Appropriate penalties should be imposed on individuals and companies involved in illegal harvesting.
3. Government agencies, non-governmental organisations and local communities should embark on regular tree-planting programmes, particularly in degraded forest areas, to restore lost vegetation cover and improve ecosystem services.
4. Government and development agencies should provide alternative livelihood opportunities for forest-dependent communities through sustainable agriculture, agroforestry, beekeeping and other income-generating activities to reduce excessive dependence on rosewood extraction.

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