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Impact of Anthropogenic Threats on Management Effectiveness of Cross River National Park, Cross River State, Nigeria

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Abstract *- This study assessed the impact of anthropogenic threats on the management effectiveness of Cross River National Park, a major biodiversity hotspot in Nigeria and habitat to endangered species such as the Cross River gorilla and the Nigeria-Cameroon chimpanzee. Using the International Union for Conservation of Nature – World Commission on Protected Areas (IUCN–WCPA) framework and Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) methodology, data were collected from 298 respondents (park staff, rangers, and support-zone communities) through structured questionnaires, alongside secondary park records (2018–2022). Data were analyzed using descriptive statistics, ANOVA, and multiple regressions at a 5% significance level. Findings revealed that illegal farming, hunting, and logging were the most significant threats. The statistical results indicated a strong link between the threats and the effectiveness of management ($F = 229.128$; $p < 0.05$; $R^2 = 0.947$), meaning that 94.7% of the differences in management performance were attributable to these factors. The study concludes that persistent human-induced pressures significantly undermine park management. It recommends strengthened law enforcement, improved funding and ranger capacity, enhanced community participation, and sustainable livelihood programs to ensure long-term biodiversity conservation.*

Index Terms- *Anthropogenic Threats, Management Effectiveness, Cross River National Park, Protected Area Management*

I. INTRODUCTION

Protected areas are crucial to international initiatives aimed at conserving biodiversity, ecosystems, and natural resources. National parks and nature reserves are established worldwide to safeguard biologically significant regions from human exploitation and environmental degradation. In recent decades, there has been an increasing transition towards organized conservation strategies in defined regions, where the utilization of natural resources is regulated to guarantee sustainability. The Protected Planet Report 2024 indicates thaof the world's terrestrial and freshwater regions are now designated as protected or conserved, alongside an additional 8.4% of marine and coastal areas under protection, demonstrating continued advancement in global conservation initiatives. The global creation of protected areas (PAs) has been a significant conservation tool to combat the concerning rates of biodiversity loss (Gizachew et al., 2024). The ongoing reduction of species populations and the deterioration of ecosystems in protected areas demonstrate that simply designating these spaces
s inadequate0lSinclair et al., 2025; Geldmann et al., 2019). Protected areas must undergo management assessment and enhancement to achieve their conservation objectives (Hockings et al., 2006; Van, 2025). Cross River National Park (CRNP) in Nigeria serves as an essential sanctuary for biodiversity, accommodating endemic and endangered species, including the Cross River gorilla (Gorilla gorilla diehli) and the Nigeria-Cameroon chimpanzee (Pan troglodytes ellioti). Conservation initiatives established inside CRNP encompass ranger patrols, habitat monitoring, community education, and partnerships with non-governmental groups (Adetola & Ofuya, 2021). Cross River National Park (CRNP), is a location in Nigeria that hosts a diverse array of flora and fauna. It possesses natural resources, precious timber, diverse animal species, fertile agricultural land, medicinal plants, and several plant species that are novel to science. The region's global biological significance facilitated the park's official formation in 1991 (Enuoh & Ogogo 2018). The Cross River National Park (CRNP) encompasses roughly 4,000 km² (Federal Department of Forestry, 2006) and is acknowledged as one of Africa's most

biologically diverse regions, hosting numerous endemic and endangered species, including the Cross River Gorilla (Gorilla gorilla diehli), the Nigeria-Cameroon Chimpanzee (Pan troglodytes ellioti), and the Forest Elephant (Loxodonta africana cyclotis) (Adendem et al., 2025; APES Atlas, 2025).The park comprises two sectors: the Oban Division in the south and the Okwangwo Division in the north, both essential elements of the Guinean Forests of West Africa, a global biodiversity hotspot. In acknowledgment of its ecological importance, numerous wildlife conservation initiatives have been implemented in and around CRNP. These encompass anti-poaching patrols, community-based conservation projects, environmental education programs, and partnerships with international organizations as the Wildlife Conservation Society (WCS), WWF, and Birdlife International (Etta et al., 2024). A multitude of these initiatives aligns with Nigeria's obligations under international treaties such as the Convention on Biological Diversity (CBD) and the Convention on International Trade in Endangered Species (CITES). Notwithstanding these conservation initiatives, biodiversity loss in CRNP continues, chiefly attributable to illegal logging, agricultural encroachment, bush meat hunting, inadequate law enforcement, and insufficient community involvement in decision-making processes (Fitz et al., 2022). The ongoing strain on the park's resources prompts essential inquiries on the efficacy of the existing programs. A burgeoning consensus among conservationists and researchers posits that successful conservation must transcend park boundaries and incorporate integrated, community-inclusive strategies that address both environmental and socio-economic realities (Schwartz et al., 2023; Bennett et al., 2021). Evaluating management effectiveness in conservation involves assessing the efficacy of a protected area's management, specifically on its capacity to safeguard values and fulfill established goals and objectives. It encompasses the evaluation of: Design of the protected area, the suitability and effectiveness of management systems and processes, the achievement of protected area objectives including the protection of values, assessment of site-specific pressures and threats, and prioritization of resource allocation.

II. STATEMENT OF PROBLEM

Cross River National Park is one of Nigeria's most prominent protected areas; it continues to suffer from biodiversity loss, weak law enforcement, limited funding, and low community participation. Despite existing management plans and periodic external support, the real-world effectiveness of park management has not been thoroughly and systematically assessed in recent years. Persistent threats such as illegal activities, lack of patrol capacity, and encroachment suggest that the park may not be achieving its conservation objectives. Furthermore, the level of involvement of local communities in decision-making and benefit-sharing remains inadequate. These gaps point to the need for an assessment of the park's management systems, outcomes, and institutional capacities to inform future conservation planning and policy development.

Most of the Parks are funded through budgetary allocations from the Federal government which is grossly inadequate to support Park operations (Nchor, 2021)

2.1 Objectives of the Study

1. Identify the major anthropogenic activities occurring in Cross River National Park
2. Assess their impacts on biodiversity and ecosystem functions.
3. Recommend strategies for mitigating human-induced pressures and enhancing biodiversity conservation in the park

2.2 Research Questions

What are the threats that are common in the park and their impacts in the overall management of the park?

2.3 Research hypotheses

Hypothesis one: Null hypothesis (Ho)

The different levels of threats had no significant impact on management effectiveness of Cross River National Park (CRNP).

III. THE STUDY AREA

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The research was carried out in Cross River National Park (CRNP), situated in Cross River State, southeastern Nigeria. Cross River National Park is a significant protected area in Nigeria, celebrated for its extensive biodiversity and the prevalence of endemic and endangered species. The Park consists of two primary divisions (Figure 1): Oban Division and Okwangwo Division. The Oban Division has an area of roughly 3,000 km² and is situated at the geographical coordinates 5°25′00″N and 8°35′00″E. Its eastern boundary adjoins Korup National Park in Cameroon, constituting a segment of a transboundary conservation landscape of global ecological importance (Adeyemi *et al.,* 2013). The Okwangwo Division is located at coordinates 6°17′00″N and 9°14′00″E. It comprises the previous Boshi, Okwangwo, and Boshi Extension Forest Reserves. The Division encompasses approximately 920 km², with altitudes varying from 150 to 1,700 m above sea level. The Okwangwo Division is approximately 50 km away from the Oban Division, separated by disturbed rainforest. It is located southwest of the Obudu Plateau and directly east of the Afi River Forest Reserve, divided by the Mbe Mountains Community Forest.

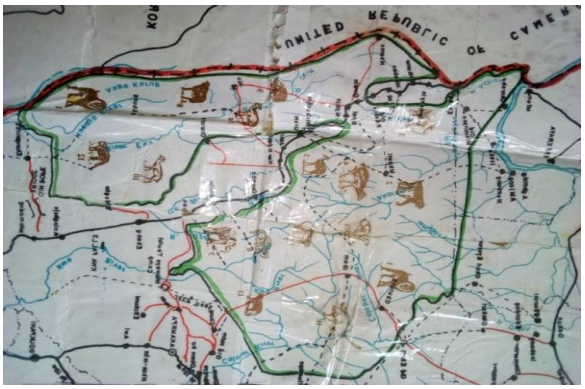

Figure 1: Map of the study area.
Source: (CRNP, 2011)

3.1 Method of data collection
Both primary and secondary data were collected.

3.1.1 Primary data collection:
The primary data collection for the study was through a structured (standard) questionnaire, designed in accordance with the Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) methodology, a globally recognized assessment framework developed by the World-Wide Fund for Nature (WWF). Table 1 is a summary of the questionnaire covering all aspects of international evaluation framework developed by the World Commission on protected areas (WCPA).

3.1.2 Administration of questionnaires
The administration of questionnaires was in a workshop setting with strict supervision from the researcher using previously collated data and Park records. This allowed for respondents to be accountable to one another. This approach ensured uniform administration of the instrument, minimized response bias, and enhanced the reliability of the data collected, as respondents completed the questionnaires in a controlled environment that promoted accountability and consistency. The questionnaire consists of a list of questions that was administered to respondents to obtain information on the status of biodiversity conservation in Cross River National Park for the period under review. The questionnaire was structured using a Likert-type scale, which allows respondents to express their judgments based on degrees of agreement or intensity of opinion across ordered response categories such as Agree, Not Sure, and Disagree, thereby facilitating measurement of attitudes and perceptions in social research (Boone & Boone, 2021). The questionnaire was developed by the research team and used for the collection of data for the study.

3.2 Park rangers
Data were collected from park rangers in the two divisions of the park (Oban division and Okwanhgwo division) to assess the level of park protection activities in the park including the level of threats affecting park management. In the Oban division of the park there are a total of 29 rangers in Oban east and 39 in Oban west giving a total of 68 rangers. Furthermore, there are 62 rangers in Okwango division. Therefore, the total numbers of rangers in the two divisions is 130 rangers. 50% of the rangers were randomly selected using simple random sampling to ensure equal probability of selection from the two sectors for the study giving a total of 65 rangers as sample size for the study. (Table 1)

3.3 Park Officials

Data were collected from staff in the Nine departments in the park namely, Human Resource Management (HRM), Ecology and Resource Management (ERM), Planning Research and ICT (PR/ICT), Works/Maintenance (W/M), Ecotourism, Finance and Account (F&A) and others (Litigation (LIT), Public Relation (PR) and Internal Audit (IA)) respectively

3.4 Sample Size of Park Staff

The sample size of the respondents (Park staff) was 50% of all the staff in the Park (374) resulting to a total of 190 respondents. (Table 3)

3.5 Support zones Communities

Six communities, three from each of the 112 support zone communities in the two Divisions of the Park were randomly selected for the study including Akim, Nsofang and Nsan in Oban sector, and Bokalum, Bamba, Okwangwo in Okwangwo sector.

3.5.1 Sample size of the selected communities

To obtain the population of the six randomly selected communities as at 2024, the population census of the six selected communities in 1991 NPC census was used to extrapolate using a 2.1% birth rate. Furthermore, 2% of the estimated population in each of the communities as at 2024 projection was used as the sample size for the study (Table 2)

Using the formula: $n = N \times p$

Where:

n = sample size
N = population size (130)
P = proportion selected (0.5)
n=130×0.5=65

So, sample size = 65 rangers.

TABLE 1

Population of the Randomly Selected Rangers and their sample size

S/N	Division	Sector	No. of Ranger Stations	No. of Rangers	Sample Size (50%)
1	Oban Division	Oban East	6	29	15
		Oban West	7	39	19
		Subtotal	13	68	34
2	Okwangwo Division	—	8	62	31
		Subtotal	8	62	31
		Grand Total	21	130	65

Source: Field Survey, 2025

Table 2

Sample size of Park staff

S/N	Department / Unit	Total Staff	Sample Size (50%)	Respondents
1	Human Resource Management	29	14.5	15
2	Ecology and Resource Management	265	132.5	133
3	Planning, Research and ICT	12	6.0	6
4	Works / Maintenance	11	5.5	6
5	Ecotourism	29	14.5	15
6	Finance and Accounts	17	8.5	9
7	Internal Audit	4	2.0	2
8	Litigation	4	2.0	2
9	Public Relations / Protocol	3	1.5	2
	Total	374	187	190

Source: Field Survey, 2025

3.6 Data Analysis

The data collected were subjected to descriptive statistical analysis, t-test and multiple regression analyses at 5% level of probability.

$Yi: = a1+b1X1 +b2X2 +.....+bnXn.$

Where: a1b1, b2, ..., bn are constants to be estimated while Yi is dependent variable and Xi are independent variables.
Yi: Management practices for effective operations in the park is the dependent variable, while the independent variables, X5.....X10 are X5: effective wildlife Ma management, X6: management inputs, X7: provision of livelihood option, X8: community participation in park management, X9: level of incentives to park rangers and local communities, X10: inadequate boundary demarcation.

Table 3
Population of the Randomly Selected Support Zone Communities and their

S/N	Sector / Division	Communities	Population 1991 (NPC)	Projected Population 2024 (2.1%)	Sample Size (2%)
1	Oban Division	Aking	829	1,640	33
		Nsofang	2,417	4,781	96
		Nsan	1,678	3,319	66
2	Okwangwo Division	Bokalum	650	1,286	26
		Bamba	894	1,768	35
		Okwangwo	1,061	2,098	42
Total	2	6	7,529	14,892	298

Source: Field Survey, 2025

IV. RESULTS

4.1 Social demographic characteristics of respondents
Information on the social demographic characteristics of respondents in the study area with respect to gender, age, educational background, occupational status is presented in Table 4. Results on the data collected in the field indicated that 59.73% were males while 40.27% were females. Moreover, this submission shows that they were more males than females in the study area. Table 4 shows the marital status of the respondents in the study area. Among them, majority (48.32%) were married, followed by 28.19% who were single and 14.77% registered as divorced. Only 8.72% were recorded as widows/widowers. Majority of the respondents (23.49%) fell within the age range of 31–40 years as recorded in the field. The next age bracket 21–30 years recorded 22.15% followed by those with 41–50 years (19.46%). The lowest age bracket (10–15 years) recorded 7.38% while those above 50 years constituted 16.20%. Results in Table 5 show the occupational ratio of the respondents in the study area. Larger proportions (35.00%) of the respondents were farmers, 26.17% were civil servants, and 20.80% were traders. Others 10.74% included hunters and cyclists, while 7.38% were artisans. On the educational background of the respondents in the study area, the results indicated that most (48.99%) of the population sampled had primary education, 28.19% had attained secondary education, while 10.74% had tertiary education, with a few (12.08%) population having no formal education (Table 4). This implies that majority of the respondents had at least primary education, with a good percentage attaining secondary education. Please find details of the demographic background of the respondents in Table 4

Table 4
Socio-demographic characteristics of respondents

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	120	40.27
	Male	178	59.73
Marital Status	Single	84	28.19
	Married	144	48.32
	Divorced	44	14.77
	Widow/Widower	26	8.72
Age (years)	10–15	22	7.38
	16–20	34	11.41
	21–30	66	22.15
	31–40	70	23.49
	41–50	58	19.46
	>50	48	16.11

Variable	Category	Frequency (n)	Percentage (%)
Occupation	Traders	62	20.80
	Farmers	104	35.00
	Civil servants	78	26.17
	Artisans	22	7.38
	Others	32	10.74
Level of Education	None	36	12.08
	Primary	146	48.99
	Secondary	84	28.19
	Tertiary	32	10.74

Source: Field Survey, 2025

4.2 Threats in Cross River National Park

Results in Table 5 shows that majority of the respondents (79.6%) were of the opinion that hunting was a serious challenge in the park. 15.3% had contrary views while 5.1% were not sure. On the situation of logging activities in the park, majority of the respondents 66.33% submitted that logging was a threat to the protection of biodiversity in the area. Others (23.5%) had contrary views while 10.2% were no sure. (Table 5). Results on illegal farming in the park are reflected in Table 5. Majority of the population sampled (87.8%) reported that local communities were involved in illegal farming inside the park. This situation was attributed to the quest for land to expand their farming activities through the expansion of cocoa and palm oil plantations. However, some of them 10.2% had contrary views. Some of the enclaves communities in the park have in recent times constitute a major challenge in the protection of the parks resources. This was reflected in the opinion of majority of the respondents (73.5%). 17.3% were not in support of this position. (Table 5).

Mining activities in the park were considered as a problem particularly in Oban division of the park as submitted by a greater number of the respondents in that division. However a greater percentage of the respondents (51.0%) representing the sample population from Okwangwo division were not in support of this position. These divergent views emanated for the fact that this threats is yet to get prominence in the area. (Table 5)

Reports of fishing as a threat in park as reported in Table 6 shows that 77.6% of the respondents considered fishing as a threats. 17.3% had contrary vies while 5.1% were not sure. Table 5 on the level of grazing in the park shows that majority of the respondents particularly those in Oban division disagreed that grazing was a problem though a greater number in Okwangwo submitted that this type of land use was posing as a threats in the area their position is likely to come from part of their landscape, the Obudu plateau has been invaded by cattle Fulani's.

Table 5
Shows the respondent's views on the level of threats in the cross river national park

Activity	Agree n (%)	Not Sure n (%)	Dis-agree n (%)	Total n (%)
Hunting	78 (79.6)	5 (5.1)	15 (15.3)	98 (100)
Logging	65 (66.3)	10 (10.2)	23 (23.5)	98 (100)
Illegal farming	86 (87.8)	2 (2.0)	10 (10.2)	98 (100)
Enclave communities	72 (73.5)	9 (9.2)	17 (17.3)	98 (100)
Mining	47 (48.0)	1 (1.0)	50 (51.0)	98 (100)
Fishing	76 (77.6)	5 (5.1)	17 (17.3)	98 (100)
Grazing	51 (52.0)	6 (6.1)	41 (41.8)	98 (100)
Mean Total	68 (69.4)	7 (7.1)	23 (23.5)	98 (100)

Source: Field Survey, 2025

4.3 STATISTICAL ANALYSIS AND TEST OF HYPOTHESIS

Hypothesis one: The different levels of threats had no significant impact on Cross River National Park (CRNP).

Results from statistical analysis and test of hypotheses are reflected in Appendix I, Table 1.

Level of threats in CRNP was used as the dependent variable, while the independent variables were hunting, illegal farming, enclave communities, mining, fishing, grazing, and logging.

From the Table 1, the calculated F-value of 229.128 exceeded the tabulated F-value of 2.10 at 0.05 probability level with 7 and 90 degrees of freedom.

From this result, the null hypothesis is rejected which implies that there is significant impact due to the threats on the CRNP. The result also revealed a high value of coefficient of determination (R^2) which implies that 94.7% variability in the level of threats in the Park is explained by the combined effect of all the independent variables.

V. DISCUSSION

5.1 Hunting / Poaching

Results in Table 6 show that 79.59% of respondents regarded hunting as a serious challenge, making it the most significant pressure affecting Nigeria's National Parks, even more than logging and grazing. Studies indicate that 64.44% of hunters in Cross River National Park and 58.3% in Old Oyo National Park hunt daily, often using guns and traps (Nchor et al., 2021). Globally, poaching affects over 80% of tropical protected areas, while hunting and NTFP collection are also widespread in Myanmar and Russia. In Nigeria, hunting is driven by poverty, unemployment, and bush meat demand, compounded by weak enforcement and limited management capacity. However, low awareness among hunters suggests that conservation education and alternative livelihood programs could help reduce the threat.

5.2 Logging

Logging was identified as a major challenge by 66.33% of respondents. Illegal logging, encroachment, and high demand for timber continue to cause forest loss, habitat degradation, and biodiversity decline despite official bans. Across Nigeria's parks, illegal logging remains widespread, with Okomu National Park recording the highest number of arrests in one study. Timber exploitation has extended into core protected areas, often involving collaboration with some community members and the transport of logs through river routes into Cameroon. Globally, logging affects nearly 70% of tropical protected areas underscoring its persistent impact on park ecosystems.

5.3 Illegal farming

Results on illegal farming in the parks as reported in Table 6 shows that majority of the respondents (87.75%) viewed that illegal farming was wide spread and significant, this is driven primarily by poverty and lack of alternative livelihood for local communities. This activity is a major cause of deforestation and habitat loss, severely impacting the country biodiversity and ecosystem stability. Study show high rates of encroachment into protected areas. In some cases, a significant percentage of farms are located within most times very close to park boundaries. This is particularly common in CRNP and GGNP were 95% and 92% are farmers respectively (Nchor *et al.,* 2021). The illegal cultivation of cash crops like cocoa is a very prominent issue with farmers establishing plantation in areas were farming is banned such as CRNP and ONP. These activities most often lead to significant decline in wildlife population and habitat destruction for endangered species like African forest elephant and pangolin. Inadequate funding, a lack of man power and equipment for patrols including, weak penalties for offenders hinder effective enforcement of conservation laws.

5.4 Enclave communities

Results of enclave communities in CRNP showed that majority of the respondents (73.47%) claimed that the issues were not a challenge in the management of the park. In CRNP, six (6) communities have been officially recognized as enclaves in the Park. They are Okwangwo, Okwa I and II in Okwangwo Division, and Mkpot, Abung and Iku in the Oban Division on the Northern part of the Park. Five of these communities (Okwa I and II, Okwangwo, Mkpot and Abung) were in existence before the establishment of the Park. The enclave

community of Iku is a recent development that came into being after the Park was created in 1987.

Two problems the management is having concerning these communities are:

i. Maintaining them where they are presently operating but under a specific participatory management and development plan to be drawn jointly by the Park and the affected communities.
ii. Resettlement of the enclave villages outside the Park where basic amenities such as hospitals, schools etc. can be provided for them.

The second option is most preferred by the management of the Park. The issue of the resettlement of these communities is a serious problem. The National Parks Board is however, taking steps to address the matter across all the Parks in the country (Gu, 2025).

4.5 Mining

Mining was perceived as a minor challenge in Cross River National Park (CRNP) by a slight majority of respondents, with 51.02% indicating that it was not a significant threat, while 47.96% expressed contrary views. Despite this perception, mining in Nigeria's protected areas remains a significant and persistent problem, largely driven by illegal, artisanal, and small-scale operations, even though national laws expressly prohibit mining within National Parks.

Cross River National Park provides a clear example of this challenge, as incidents of illegal mining have been recorded within its boundaries. Environmental advocacy groups have repeatedly called for independent environmental impact assessments to ascertain the extent of ecological damage resulting from past and ongoing mining activities. Such activities in ecologically sensitive landscapes result in severe environmental degradation, including habitat destruction, deforestation, soil erosion, water pollution, and the consequent loss of biodiversity. Recent enforcement actions highlight the seriousness of the issue. Fourteen suspects were convicted and sentenced to six months' imprisonment for illegal mining and related offences in CRNP, with additional custodial sentences imposed on those who failed to pay a fine of ₦200,000.00. These developments underscore both the prevalence of illegal mining and the growing resolve of authorities to curb the practice.

Beyond environmental impacts, illegal mining poses grave security risks to park personnel. The infiltration of protected areas by illegal miners, poachers, and wildlife traffickers has become a recurring and distressing challenge for park managers, often resulting in violent confrontations. In some cases, rangers have lost their lives in the line of duty. For instance, in Old Oyo National Park, thirty-seven suspects were arrested for illegal mining following the killing of two park officers at the Abata-Abu axis of the Park. Such incidents illustrate the dangerous nexus between illegal resource extraction and organized criminal activity within protected areas, emphasizing the urgent need for strengthened law enforcement, improved ranger safety, and sustained inter-agency collaboration (Lameed *et al*., 2025).

5.6 Fishing

Results in Table 6 showed that (77.55%) being the majority were of the views that fishing was not a challenge in the management of the park. This is because the situation is not widespread. In the National park service, one of the areas that are considered vulnerable to fishing is in KLNP with significant increase in fishing activates after its establishment. However in recent times the Kanji Lake eventually showed signs of over fishing with the increase of fishing boat which leads to decrease in number of fish catch (Manga *et al*., 2024)

5.7 Grazing

Results in Table 6 on the impact on grazing in CRNP under study shows that majority of the respondents (52.04%) disagreed that grazing was widespread in the Parks. This threat was only regarded as a major challenge in the Okwangwo Division of the park that boarders with high ranges of Obudu ranch resort.

VI. CONCLUSION

Cross River National Park is a globally important biodiversity hotspot, home to endangered species such as the Cross River Gorilla and the Nigeria-Cameroon Chimpanzee. This study found that anthropogenic threats, particularly illegal farming, hunting, and logging, significantly undermine the

park's management effectiveness. Statistical analysis showed a strong and significant impact of these threats on management performance ($F = 229.128$; $p < 0.05$), explaining 94.7% of the variation observed

VII. RECOMMENDATIONS

To address the major threats affecting Cross River National Park, the following key actions are recommended:

1. Strengthen law enforcement by increasing ranger capacity, improving equipment, and enhancing inter-agency collaboration to combat hunting, logging, and illegal mining.
2. Control illegal farming and encroachment through clear boundary demarcation, stricter penalties, and promotion of sustainable alternative livelihoods for surrounding communities.
3. Promote community participation by adopting participatory management approaches, environmental education, and benefit-sharing mechanisms to reduce dependence on park resource.

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