

## MANAGEMENT STRATEGIES FOR THE SUSTAINABILITY OF FOREST RESOURCES IN CROSS RIVER STATE, NIGERIA

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### Abstract

This study examines the management strategies of forest resources in Cross River State, Nigeria. Two research hypotheses guided the study, and a correlational research design was adopted. The study population comprised 312,149 household heads in the southern senatorial district of Cross River State. The study sample comprised 1,230 individuals from four Local Government Areas, obtained through a multi-stage sampling procedure. The instrument constructed by the researchers, 'Forest Management Strategies and Sustainability of Forest Resources Questionnaire (FMSSFRQ)' was used for data collection. Experts from the Measurement and Evaluation Unit of the Department of Educational Psychology at the University of Calabar validated the instrument. To assess the reliability of the instruments, the Cronbach's alpha method was used. The coefficient estimates obtained from the results ranged from .78 to .90. Simple Linear Regression was used for data analysis. The results of the analysis reveal that the forest protection strategy and the Afforestation/Reafforestation strategy significantly contribute to the sustainability of forest resources in Cross River State. The study concluded that forest management strategies significantly contribute to the sustainability of forest resources in the study area. It was recommended, among others, that the Government of Cross River State establish as many protected areas as possible across all forest communities to reduce forest exploitation and enhance the sustainability of forest resources in the communities.

**Keywords:** Forest management strategies, forest protection, afforestation/reafforestation, sustainability, forest resources.

### Introduction

Forest management is an all-encompassing approach in which all practices aim to protect the forest ecosystem, preventing adverse and destructive activities. Forest management, as per Adekunle et al. (2018), is simply the use of science, economics, and technology to maintain the forest environment in a pristine condition. They described forest management as organising a forest property so it remains in good condition, with all necessary actions planned in space and time for maintenance and protection, while ensuring controlled utilisation of its resources. It comprises

three major aspects: controlling the composition of the growing stock and its structural elements, exploiting and marketing its resources, and property management and personnel administration (Paul, 2021).

Forest management essentially entails maintaining forests for their ecological services, economic benefits, and social relevance to local communities. Considering the scale at which the forest environment of Cross River State is destroyed, despite people knowing about its economic, socio-cultural and environmental benefits for the local people's survival, suggests inefficient forest management policies in place, thus, necessitating innovative and pragmatic policies to foster forest resource sustainability in the state (Amuyou et al., 2021). Forests provide numerous services, making the sustainability of their resources a phenomenon that can never be overemphasised in advancing community progress. Local communities rely on a sustainable ecosystem for their sustenance since they meet their vital dietary needs for now and for the future, enhance the livelihood conditions of local populations, minimise their dependence on the agriculture sector from negative natural factors, risks, as well as threats, while empowering them to rely on themselves more (Onwubuya et al., 2019; Egere & Etim, 2021). An appreciation of the social, economic, environmental, cultural, and biological advantages of sustaining forest resources is expected to minimise the harmful forest management methods used in communities in Nigeria, yet the depletion rate is on the rise in Cross River State.

Forest reserves and protected areas are continually depleted by unsustainable practices such as indiscriminate timber logging, uncontrolled wildfires, and large-scale deforestation across all communities in the state. In addition, several animal species have become rare in many of the communities in the state because of wildfires, and the indiscriminate killing of animals such as monkeys, antelopes, buffalo, and porcupines. Many communities have no virgin forest due to unregulated extensive agriculture while access to seafood has become extremely difficult due to destructive fishing practices like blast fishing, dynamite, beach seine, and poisoning, among other techniques.

Furthermore, encroachments in protected areas such as the Urban Forest Reserve and the National Park of Cross River State, where residents go illegally for fuelwood, timber, fishing and hunting, are prevalent in some communities in the state. These destructive human actions do not in any way bode well for the social, economic, and environmental well-being of the state's residents. The reason for some individuals' extreme dependence on forest resources has been attributed to the lack of viable occupation within their communities.

Some community residents explained they depended on the resources because they had no alternative livelihood; some attributed their overexploitation of forests to government apathy toward community development, and others to socio-economic disparities within their communities. At this alarming rate, the depletion of forest resources in the near future, with severe social, economic, and environmental impacts on communities, is best left to the imagination. However, Iheke and Eziuche (2016) identified the importance of forest resources to rural livelihoods, including food security, medicine, housing, timber, fuel, and money. The consequence will inevitably result in hardship and dire environmental conditions in future for people in these communities in Cross River State. Sustainable forest resource management requires deliberate, effective steps to preserve the forest ecosystem and maintain sustainable yield and productivity. Natural biodiversity can be sustainably maintained by planning scientific, careful conservation, use of land, water, soil, plants, and animals in order to ensure that the people and communities can

meet present needs, and the present generation can make sure that the future generation can meet their own needs as well (Babu & Nautiyal, 2015; Ekpoto et al., 2026).

Sustaining forest resources is the process of planning, organising, and managing a forest property for immediate or future benefit. The management and sustainable utilisation of forests and the lands from which they come, so that they may provide goods and services now and, in the future, without negatively impacting upon other natural resources. Researchers have argued that large-scale deforestation resulting from unplanned modernisation and the intensive utilisation of resources such as plants and animals, coupled with the widespread use of chemicals, disrupts several elements of the natural ecosystem (Etan et al., 2021; Martín-Garca and Diez, 2014).

Maintaining sustainable forest resources is also achievable through minimising uncontrolled fires, overlogging, illegal hunting, and overexploitation of firewood, as well as through promoting environmentally friendly fishing and agricultural practices. There is no doubt that several strategies can address forest sustainability through its components. This may include, but is not limited to, the sustainability of forest cover and the sustainable use of forest resources. Sustainability of forest cover entails minimising indiscriminate fire outbreaks, overgrazing, and overcropping in communities, all of which can lead to deforestation and species impoverishment of flora and fauna. Indiscriminate burning of bushes can destroy forest cover and increase the risk of biodiversity loss, as many animal species may be lost due to the destruction of their habitat (Ekpoto et al., 2026). Indiscriminate bush burning exacerbates environmental problems such as the depletion of the Ozone layer. Festus (2012) is of the opinion that sustainable agricultural practices, rather than the slash-and-burn method of farming, land management, and the avoidance of indiscriminate bush burning, are needed for forest conservation, the protection of endangered species, and the promotion of ecotourism.

### **Statement of the Problem**

The proper and rational application of appropriate, ecologically sound forestry management practices to maintain and sustain the natural resource base within the forest is sustainable management of forest resources, serving the forest needs of man and the ecosystem at all times. It is very unfortunate to observe that the degree of unsustainable practices is rising at an unprecedented rate almost everywhere in the communities within the state. High degree of indiscriminate burning and continuous exploitation of the state, the extermination of several animal species such as Monkeys, Buffalo, and porcupine in some communities due to indiscriminate bush burning in dry seasons and wanton hunting of endangered species in forest communities of the state. Many communities in cross river do not have forest or virgin forest anymore due to lack of regulation of farm activities in their locality and communities do not have sea food species of fish for consumptions due to the high number of destructive fishing method such as blasting/dynamite fishing, beach seine netting, spear fishing, traps/pot fishing, and fish poisoning among others and individuals dwelling around protected areas like urban forest reserve, Cross River National Park; sneak in to fetch fuel wood, fell trees, fish and hunt with/without appropriate permit.

These unsustainable forest resource uses do not bode well for the environment, the state's economy, and people in the years to come. The future sustainability of forest biodiversity will likely be threatened by the alarming trend of destructive forest practices in Cross River State. Although measures such as prohibiting logging in some areas and the launch of some trees planting programmes and prohibition of bush burning in rural communities, by the Cross River State Government were set to bring down the level of forest resource destruction in the state, it remains

astounding that intensive forest resource use is common in the rural areas of the state since there are better options for sustainable utilisation of forest resources through appropriate management methods.

### **Purpose of the Study**

The purpose of this study was to examine forest management strategies for the sustainability of forest resources in Cross River State, Nigeria. Specifically, the study was to find out whether:

1. Forest protection strategy predicts the sustainability of forest resources.
2. Afforestation/Reforestation strategy relates to the sustainability of forest resources in Cross River State.

### **Research Hypotheses**

The following hypotheses guided the study:

1. Forest protection strategy does not significantly predict the sustainability of forest resources in the Calabar Education Zone of Cross River State.
2. Afforestation/reforestation strategy does not significantly predict the sustainability of forest resources in the Calabar Education Zone of Cross River State.

### **Literature Review**

#### **Forest protection strategy and sustainability of forest resources.**

Strategies to conserve forest cover within forest communities and to avoid the depletion of forest resources in these areas include the adoption of sacred groves, evil forests, national parks, game reserves, nature reserves, and other forest reserves. Iheke & Eziuche (2016) stated that a few forests were considered evil forests because of the forces that inhabit them. They observed that persons who were subjected to early or violent death were thrown into the forests to be their inhabitants. This, however, was believed by evil forests that possessed the life elixir and wherein all important spiritual religious rites were held.

The protection of ecosystems and the reduction of poverty are examined through parks and reserves, whether it is a trade-off or a win-win, by Ferraro et al. (2021). They said that the protected area system, including national parks and reserves, is a very important conservation strategy worldwide for protecting ecosystem services and biodiversity. However, in conservation areas, preventing the exploitation of natural resources and agricultural development are seen as important objectives for reducing poverty. Some scholars argue that these systems protect people by reducing their economic status and have been fiercely debated in developing countries, as poverty reduction is a very important objective in the developing world. The advocates for conservation stated that the presence of the park could reduce poverty by providing ecosystem services, boosting tourism, and increasing economic development (Ferraro et al., 2021). A 'win-win' situation was one in which both systems, ecosystems, and their services were conserved while simultaneously helping reduce the incidence of poverty. The authors found that environmental and socio-economic outcomes vary across the landscape and that characteristics associated with the strongest deforestation reductions are those with the weakest impacts on poverty reductions. A win-win strategy can be feasible if policies are designed to satisfy a sufficiently low minimum for either

outcome, but there is no guarantee if more of either is desired. This article aims to show that the forest protection strategy can serve both objectives.

In fact, according to Naughton-Treves et al. (2005), a number of factors demonstrate that protected areas offer many benefits for maintaining biodiversity and local livelihoods. The author states that protected areas grew rapidly over 25 years worldwide, especially in developing countries with high biodiversity. Their research concludes that protected areas not only help conserve biodiversity but also aim to improve people's livelihoods, leading to the introduction of forest protection to reduce poverty in rural areas. Their review indicates that protected areas are an important mechanism for supporting and encouraging sustainable biodiversity, as they offer many advantages for local communities. The writers said that these authors reported that many interventions are designed to establish a link between protected areas and the welfare of the local community, and that some have already successfully established this connection. However, the review reported several drawbacks of the protected area policy for human well-being. According to the writers, a more thorough approach to conservation needs to address the policy context of poverty and biodiversity loss.

### **Afforestation/reforestation strategy and sustainability of forest resources**

The processes of both afforestation and reforestation are widely accepted strategies used throughout the world to maintain and expand forests, as well as the other resources derived from them. Woodfine (2019) explained that "Afforestation is a reforestation approach for managing degraded lands which do not yet qualify as forest lands," whereas "Reforestation involves the reintroduction of trees to formerly forested land." Reyer et al. (2009) stated that "Afforestation and reforestation can be thought of as ways of increasing (or at least maintaining) the benefits provided by the forest ecosystem."

In addition, "Afforestation, reforestation and control of deforestation are typically regarded as the most important climate-change mitigation projects in the forest sector. The aim of sustainability is to conserve and extend forests so that the demand for resources is met, jobs are secured, local communities benefit from forest resources and amenities, and ecosystem services are preserved while the forests' contribution to climate mitigation is also enhanced" (Etan et al., 2025a). "Afforestation and reforestation are viewed as carbon sequestration projects in the clean development mechanism (CDM) in order to reduce the carbon emissions generated from land degradation so as to achieve the global environmental benefit of climate change mitigation, and subsequently, enhancing land-based livelihood security, food security, and combating land degradation" (Etan et al., 2025b). Dongre (2011) further explained that, "Afforestation helps reduce pressure on natural forest resources for obtaining timber, firewood, fruit and fodder by substituting these resources with those from new trees. On the global level, the afforestation and reforestation process is also acting as a bridge between developed and developing countries for the realisation of the global benefits through the Clean Development Mechanism (CDM), and it contributes to the achievement of global environmental sustainability." Buscardo et al. (2008) investigated the short-term impact of afforestation on grassland diversity in Ireland.

They observed that the planned target rate of afforestation in Ireland for the next 30 years is 20,000ha annually. If this rate is maintained, the overall increase in forests in Ireland over 30 years is equivalent to 17% of the current forest area." In addition, they noted, "Understanding how best to achieve this expansion while maintaining or improving the quality and conservation value of

habitats for native flora and fauna is dependent on knowledge of grassland diversity prior to afforestation and of impacts of tree planting on biodiversity.”

The main objectives of this study were: 1) To document changes in grassland vegetation composition and diversity during five years following afforestation, and 2) To identify ecological and management factors controlling the observed vegetation changes. Vegetation and habitat information were collected from 16 afforested and unplanted control site pairs across two habitat types, improved grassland and wet grassland, in a network of six counties in Ireland. A substantial change in the number of species present, their composition, and their abundance occurred over five years of afforestation. More Competitive and vigorously growing grasses were present in the planted grasslands than in control grasslands, as were generally more habitat-generalist species that can tolerate shade to a degree.

In contrast, more specialised shade-tolerant, low-stature plants were present at reduced levels in afforested areas. Total species number (vascular) and Shannon’s diversity in wet grassland were greater in unplanted grasslands than in areas after afforestation. Bryophyte diversity was highest in planted improved grassland sites. Vegetation changes in these areas were mainly driven by the absence of livestock grazing, by management interventions during planting such as ploughing and, in some areas, drainage, and by changed fertiliser management” (Buscardo et al., 2008).

This data can be interpreted to confirm that by afforesting, community reliance on and therefore unsustainable use of existing forests for needs such as firewood can be reduced, boosting the sustainability of community forest resources.

## **Method**

The study utilised a correlational research design. The study population consists of 312,149 household heads from the southern senatorial district of the Calabar Education Zone in Cross River State. The sample size of 1,230, drawn from four Local Government Areas, was collected using a multistage sampling technique. The data were collected using an instrument constructed by the researcher (Forest Management Strategies and Sustainability of Forest Resources Questionnaire – FMSSFRQ). The instrument was validated by experts in the Department of Educational Psychology (Measurement and Evaluation Unit), University of Calabar. The instrument's reliability was determined using the Cronbach's alpha formula; the coefficients ranged from .78 to .90. Simple linear regression was used to analyse the data.

## **Results**

### **Hypothesis one**

Forest protection strategy does not significantly predict the sustainability of forest resources in the Calabar Education Zone of Cross River State.

The two variables in this hypothesis were forest protection strategy and the sustainability of forest resources in the Calabar Education Zone of Cross River State. Both the forest protection strategy and the sustainability of forest resources in the Calabar Education Zone of Cross River State were measured continuously. To test this hypothesis, Simple Linear Regression analysis was used. The result of the analysis is presented in Table 1.

Table 1 summarises the results of the analysis of the relationship between forest protection strategy and the sustainability of forest resources in the Calabar Education Zone of Cross River State, using Simple Linear Regression. From the table, the analysis of variance in the regression results yields

a high F-ratio of 1303.895 with a corresponding probability of 0.000. This result is statistically significant at the .05 significance level, with a critical F-ratio of 3.85 and degrees of freedom 1 and 1198. This implies that the forest protection strategy fits the data better than if it had not been included, supporting sustainable management of forest resources in the Calabar education zone of Cross River State. In Table 1.0, the results show that the forest protection strategy is related to the sustainability of forest resources in the Calabar education zone of Cross River State, as indicated by a regression coefficient of .722 and a coefficient of determination ( $R^2$ ) of .521. It also mean that about 52.1% of variation in the sustainability of forest resources in Calabar Education Zone of Cross River State was accounted for variation in the use of forest protection strategy as applied by the people in the forest communities across the state while 47.9% variation in sustainability of forest resources in Calabar Education Zone of Cross River State was attributed to the effect of other variable not examined in this study.

Similarly, the result in Table 1 on regression weights for the predictor variable forest protection strategy shows positive unstandardised (B) and standardised (Beta) coefficients of 1.617 and 0.722, respectively. It signifies that forest protection strategy has a positive relationship with the sustainability of forest resources in Calabar Education Zone of Cross River State, meaning a unit improvement in forest protection strategy application as a strategy for forest management among communities living in the forest zone of Calabar Education Zone will result in more than one unit improvement in the sustainability of forest resources in the zone. The t-test in Table 1.0 shows a high t-value of 36.109 at the 0.000 significance level, which is less than the .05 significance level, implying that the forest protection strategy was a statistically significant predictor of variation in the sustainability of forest resources in the Calabar Education Zone of Cross River State. Thus, hypothesis three was rejected and accepted. This implied forest protection strategy did contribute significantly to the sustainability of forest resources in the study zone.

**Table 1:** Summary of simple regression analysis for the relationship between forest protection strategy and sustainability of forest resources in Calabar Education Zone of Cross River State

| R                          | R Square       | Adjusted R Square | Std. Error of the Estimate |             |          |                   |
|----------------------------|----------------|-------------------|----------------------------|-------------|----------|-------------------|
| .722                       | .521           | .521              | 4.608                      |             |          |                   |
| Model                      | Sum of squares |                   | df                         | Mean square | F-ratio  | Sig.              |
| Regression                 | 27688.995      |                   | 1                          | 27688.995   | 1303.895 | .000 <sup>b</sup> |
| Residual                   | 25440.255      |                   | 1198                       | 21.236      |          |                   |
| Total                      | 53129.250      |                   | 1199                       |             |          |                   |
| Variable                   | B              | Std. Error        | Beta                       |             | t        | Sig.              |
| (Constant)                 | 26.937         | .871              |                            |             | 30.922   | .000              |
| Forest protection strategy | 1.617          | .045              | .722                       |             | 36.109   | .000              |

a. Criterion: Sustainability of forest resources in Calabar Education Zone of Cross River State

b. Predictors: (Constant), forest protection strategy.

## Hypothesis two

Afforestation/reforestation strategy does not significantly predict the sustainability of forest resources in the Calabar Education Zone of Cross River State.

The two variables in this hypothesis were afforestation/reforestation strategy and the sustainability of forest resources in the Calabar Education Zone of Cross River State. Both the afforestation/reforestation strategy and the sustainability of forest resources in the Calabar Education Zone of Cross River State were continuously measured. To test this hypothesis, Simple Linear Regression analysis was used. The result of the analysis is presented in Table 2.

**Table 2:** Summary of simple regression analysis for the relationship between afforestation/reforestation strategy and sustainability of forest resources in Calabar Education Zone of Cross River State

| R                                    | R Square       | Adjusted R Square | Std. Error of the Estimate |             |         |      |
|--------------------------------------|----------------|-------------------|----------------------------|-------------|---------|------|
| .436                                 | .190           | .190              | 5.992                      |             |         |      |
| Model                                | Sum of squares |                   | df                         | Mean square | F-ratio | Sig. |
| Regression                           | 10119.729      |                   | 1                          | 10119.729   | 281.878 | .000 |
| Residual                             | 43009.521      |                   | 1198                       | 35.901      |         |      |
| Total                                | 53129.250      |                   | 1199                       |             |         |      |
| Variable                             | B              | Std. Error        | Beta                       | t           | Sig.    |      |
| (Constant)                           | 40.168         | 1.078             |                            | 37.276      | .000    |      |
| Afforestation/reforestation strategy | .981           | .058              | .436                       | 16.789      | .000    |      |

a. Criterion: Sustainability of forest resources in Calabar Education Zone of Cross River State

b. Predictors: (Constant), afforestation/reforestation strategy.

Results in Table 2 reveal that the regression analysis yielded an F-ratio of 281.878 ( $p < .05$ ), which is significant at the .05 level when the critical F-ratio is 3.85, and the degrees of freedom are 1,198. This finding implies that the data on the afforestation/reforestation strategy fit the model better than if the afforestation/reforestation strategy were not added to the model, and this implies that the afforestation/reforestation strategy makes a unique contribution to the variance in the sustainability of forest resources in the Calabar Education Zone of Cross River State.

In addition, Table 2 revealed a regression coefficient (R) of .436 and a coefficient of determination ( $R^2$ ) of .190. This suggests that the afforestation/reforestation strategy significantly relates to the sustainability of forest resources in the Calabar Education Zone of Cross River State and that 19.0% of the variation in the sustainability of forest resources in the Calabar Education Zone of Cross River State is explained by the variation in the afforestation/reforestation strategy on forest communities in the Calabar Education Zone of Cross River State. While 81.0% of the variance in the sustainability of forest resources in the Calabar Education Zone of Cross River State is beyond those factors in the current study. Similarly, the result in Table 2 indicated that the beta coefficients (B and beta) for the predictor variable (afforestation/reforestation strategy) were .981 and .436, respectively.

This means that the afforestation/reforestation strategy relates positively with the sustainability of forest resources in the Calabar Education Zone of Cross River State, and also, a unit improvement

in the use of afforestation/reforestation practice as a strategy for forest management in forest communities of the Calabar Education Zone of Cross River State results in a change in more than one unit in the sustainability of forest resources of the zone.

From Table 2, the t-value is 16.789 ( $p < .05$ ). This means that the afforestation/reforestation strategy contributes significantly to the variation in the sustainability of forest resources in the Calabar Education Zone of Cross River State. Hence, the null hypothesis is rejected. Thus, afforestation/reforestation strategy contributes significantly to the sustainability of forest resources in the Calabar Education Zone of Cross River State.

## **Discussion**

The results of this study reveal that forest protection and afforestation/reforestation strategies were significant factors in the sustainability of forest resources in Cross River State. Forest protection, however, was found to have a stronger predictive influence. The findings showed that forest protection strategy accounted for 52.1% of the variation in the sustainability of forest resources, and afforestation/reforestation accounted for 19.0%. This means that while both measures are pertinent to sustainable forest management, protecting forests rather than restoring forests already degraded is more significant at the moment.

Because of the strong influence of forest protection, the sustainability of forest resources in Cross River State is related to the capacity to manage illegal logging, indiscriminate bush burning, over-hunting, farming encroachment, fuel wood removal and unauthorised use of protected forests. This aligns with current forestry management guidelines, which emphasize the value of preserving existing forests rather than replacing them with planted forests. FAO sees innovation, good governance and evidence-based forest management as key cornerstones of sustainable forest futures. The Convention on Biological Diversity's Target 3 also emphasises the importance of conserving protected areas effectively, connecting them, and managing them in a fair and equitable manner by 2030.

The discovery is significant because Cross River State is one of Nigeria's largest forest landscapes with ongoing deterioration of forest cover. Since 2001, Cross River has lost approximately 160,000 hectares of tree cover, or 12% of its 2000 extent, according to Global Forest Watch. This validates the study's findings that the only way to achieve forest-resource sustainability in the state is to make policy statements and then enforce them, with community involvement, boundary protection, and control over destructive livelihood practices.

Large-scale afforestation/reforestation also demonstrate that restoration is an indispensable part of sustainable forest management. Rehabilitation of degraded forests, enhancement of soil protection, carbon storage, and habitat restoration can be achieved through tree planting, enrichment planting, community woodlots, agroforestry, and assisted natural regeneration. Its lower explanatory power, however, implies that restoration is best used in conjunction with protection. The lack of consideration of fire, grazing, illegal clearing and poor upkeep can mean that trees planted without these measures may be less effective in the long term.

In general, the results suggest an integrated protection/restoration approach for sustainable forest management in Cross River State. Forest protection should be emphasised; afforestation and reforestation should be enhanced to replenish degraded areas. Both approaches need to be accompanied by community involvement, environmental education, alternative livelihoods, forest law enforcement and ongoing monitoring for better outcomes. This therefore confirms that to

achieve the sustainability of forest resources in Cross River State, planting new trees is not enough; more importantly, protecting the existing forest resources is also required.

### Conclusion

Based on the findings, it was concluded that the forest protection and afforestation/reafforestation strategies significantly contributed to the sustainability of forest resources in the Calabar Education Zone of Cross River State. It was also concluded that to sustainably maintain the forest ecosystem in Cross River State, pragmatic measures should be put in place to enhance forest management in communities within the Calabar Education Zone.

### Recommendation

1. The Government of Cross River State should establish as many protected areas as possible across all forest communities in the Zone, as this will reduce forest exploitation and enhance the sustainability of forest resources in these communities.
2. Environmental agencies should take adequate steps to encourage reforestation and afforestation in communities in the Calabar Education Zone of Cross River State. This will boost the level of sustainability of forest resources in the Zone.

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