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Research Paper

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Tourism infrastructure development and its impact on flora species status in some selected tourism sites in Cross River State, Calabar

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ABSTRACT
The study was undertaken in the southern region of Cross River State, Nigeria with the aim of assessing the extent of damage to flora diversity by the construction of tourism infrastructures in the tourism hotspot. The postulated will (H_0) hypothesis that there is no significant relationship between infrastructural development and species loss was rejected at 0.05 level of significance was rejected and the alternative hypothesis that exist a strong positive relationship was upheld. In other words, the further away from tourism infrastructure, the more species diversity.
The species diversity at index at Aqua vista (D=1.097).
TINAPA (D = 0.360); Iyata farms (D = 1.091); kwa falls (D = 1.087). in each of this site the species Weiner which ranges from 1.5 to 3.5. It is worse at TINAPA which has more infrastructure development. There is therefore need to control infrastructure development in existence sites.
KEY WORDS: *infrastructure, Development, Flora, Species diversity tourism sites impact.*

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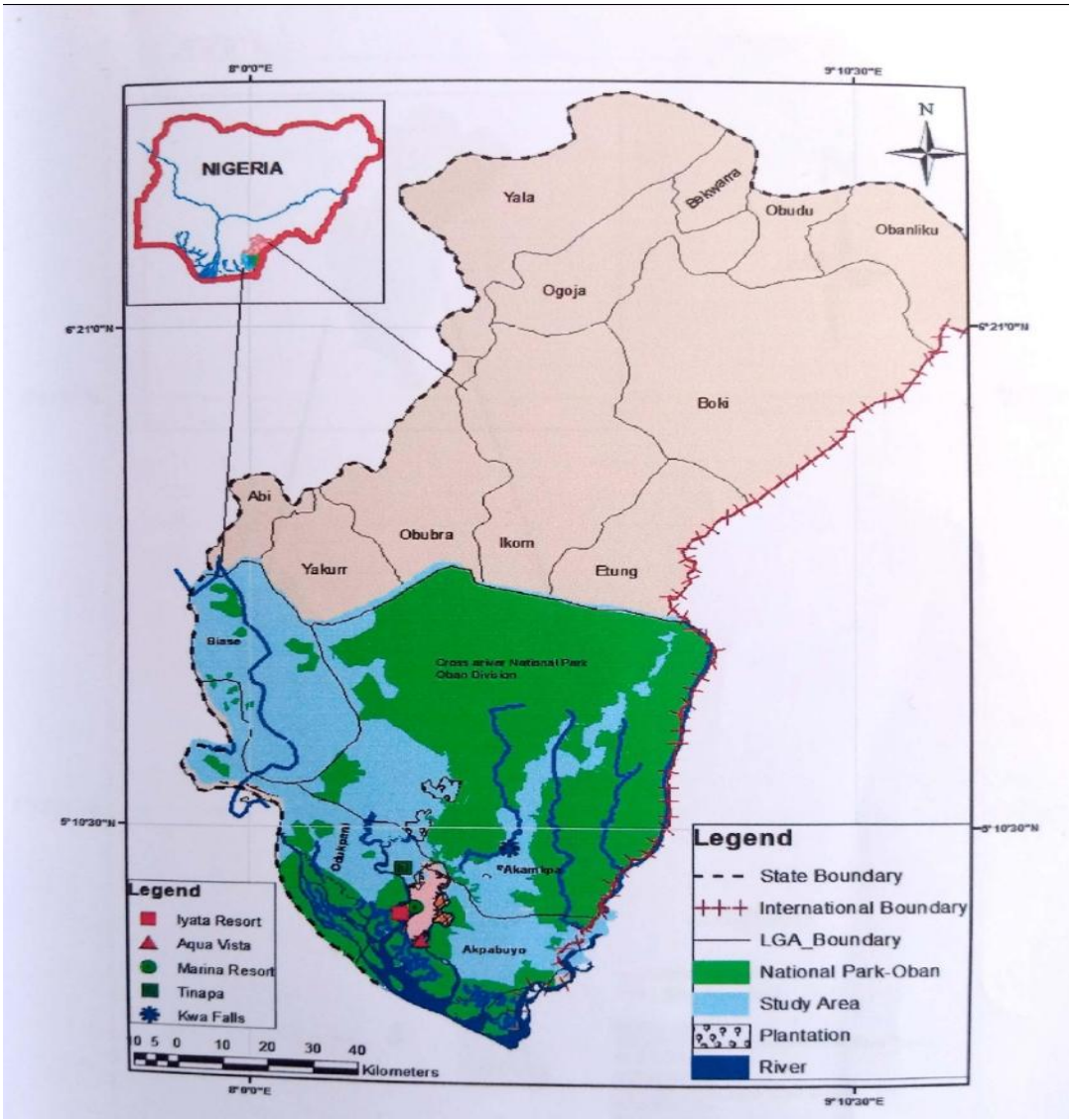
I. INTRODUCTION/REVIEW OF LITERATURE

The study was conducted in southern region of Cross River State covering some purposively selected Eco-tourism sites such as Marina Resort; (Calabar Municipality) TINAPA Business Resort (Odukpani Local Government Area) and Kwa falls (Akamkpa Local Government Area).

The southern Cross River State is located between longitude 7^0 15^1 85" and 8^0 55' 30" E and latitude 5^0 40' 00" and 4^0 38 39" N. Southern Cross River State is bounded in the East by the Republic of Cameroon, in the West by Ebonyi, Abia and AkwaIbom State, in the south by the Atlantic ocean and in the North by Yakurr Local Government Area. The southern Cross River State is located within the tropical rainforest belt of Nigeria.

Fig. 1 (Map of Cross River State).



Since the study is specifically on the flora species it is important to give a brief account of the vegetation of Cross River State.

The area has wetland or mangrove vegetation in the coast of Calabar and rain forest in the region of Akamkpa where a lot of economic features abound.

The coastal areas of Calabar metropolis and the rain forest of Akamkpa present themselves as hotspots for economic destinations, Cross River State is said to be the "nation's remaining rainforest and wildlife sanctuary and therefore is physically a microcosm of Nigeria. Except for the sahel, all the other ecological zones in Nigeria are represented in the state where Calabar and Akamkpa Local Government Area belong (Africa Research Association, 2003:8).

The rainforest of Cross River State where Akamkpa Local Government Area is located is endowed with rich variety of flora and fauna species of the Cross River High Forest which reflects great species richness of the vegetation to accommodate various forms of tourist sites, varying from wild life species, amazing cultural dynamics, mountain, climate, historical caves, adhering hills, beautiful local arts and crafts, waterfalls,, endangered species such as the lowland gorillas green mangrove forests, varieties of agricultural products and warm hospitality. The unique endowment of the Cross River State has resulted in the recognition of this region as a naturally rare global site with acclaimed potential (Bisong 1999 and Egbaji, 2007).

In recent times, there has been an increased pere of infrastructural development on tourism hot-spots in Cross River State. Such hotspots which have attracted state wide attention include the Marina Resort, Tinapa Business environment, Kwa falls and Aqua vista amongst others. Efforts geared towards infrastructural

development after result in negative environmental impacts in terms of changes in vegetation, reduction and distribution of flora species. Other impacts are pollution from effluents and wastes discharged from hotels into nearby water bodies and surrounding environment. Anticipated economic benefits from tourism as observed by Robinson and Picard (2006) encourages infrastructure that are not well planned especially in the context of developing countries with relative weak legislative and executive powers to protect the environment.

Moreover, poorly informed tourists can induce damage of fragile ecosystems by trampling on the surfaces, disturbing wild life, contributing to footpaths erosion, over using local water resources and removing plants for souvenirs.

In view of the vast area of flora diversity endowment and the rapid rate of tourism infrastructure development in Cross River State, all too often environmental implications ensue which adversely affect the natural areas such as the Cross River wetland and rain forest which harbours a wide variety of flora species of over 1019 species (Bisong 1998), infrastructural establishment are said to "frequently disrupts the physical environment, after the chemical environment, impact species co-actions, accelerate introduction of enotic species and modify animal behaviour" (Andrews 1990, Forman & Alexander, 1998; Trambulak and frissell, 2000:131). According to UNEP (2002a) infrastructure development is ecologically said to affect 22 – 50 percent of the land area in the USA, 5-15 percents of the Artic including boreal forest and as much as 48 percent at a global scale through fragmentation, disturbance, and avoidance to traffic corridors by wildlife (Forman, 2000, UNEP, 2002a). Projections are that by 2030 as much as 72 percent of the global environment may become affected. It is clear that though tourism infrastructure development has affected the ecosystem in Cross River Sate there is no study yet on this.

The construction of roads, emporia, hotels, recreational facilities and other facilities that give comfort to tourist is impacting on flora diversity of the study area. This clearly indicates that while the tourism initiative is laudable, various biological resource components are likely to become impacted through species decline or extinction. Other ecological consequences of flora diversity alterations include transformation and fragmentation of ecological communities, loss of genetic diversity at multiple levels in wild species and species invasion.

It is important to investigate the effect of ecotourism infrastructure development in flora diversity at the initial stage where impacts may be minimal (Rome, 1999). Hence this study sets out to examine the effects of the infrastructural development on the flora diversity status in the Cross River South.

Aim and objectives of the study

The aim of the study is to evaluate the impact of infrastructural development on flora diversity in ecotourism sites in Cross River State.

Specifically, the objectives include to:

(i) To investigate the land cover characteristics before the development of tourism infrastructure in the study area.

(ii) To assess the rate of degradation of vegetal cover due to ecotourism infrastructure development.

Scope of the study:

The study was limited to the effect of infrastructure development in flora diversity status (with emphasis on vegetation loss, reduction and disappearance attributes). The area considered for his study included sampled tourism hot-spot (Kwa fall in Aneneji in Akamkpa, TINAPA Business and Leisure Resort, and Iyata farm in Adiabo and Aqua Vista in Calabar South) all in the southern Cross River State, Nigeria.

Hypothesis: The only hypothesis that is considered for this work is stated thus:

H_0: There is no significant Relationship between infrastructural development and species loss in tourism sites.

II. Material/Method

Data were collected directly by the researcher from the field, through random sampling from the quadrate. The tree in the tourism hotspot areas of Calabar and Odukpani wetland and in the rainforest of Akamkpa were used for the study.

Only trees, regardless of their species were used for the study. What was regarded as trees is any perennial plant with an elongated wooden stem or trunk, supporting leaves or branches. Transect –based methods were used to survey the changes in the vegetation in each of the sites. This is in line with the transect method adopted by Sutherland (1997). A hundred metres transect was used and measured from the closest infrastructural facility in the hotspot into the bush (flora diversity).

This hundred metres trance was divided into ten different quadrate of 10 x 10 metres plots for woods, species (Xu, Louis & Janet, 2009) each. This 10 x 10 metres frame quadrate was the local frequency of species

in each quadrate and their variation was calculated along the transect and corrected with the Shannon – Weiner index in each site.

The advantage of this method is that it traverses a wide spectrum of floristic variation in the study area. Large areas that may run into hundreds of kilometers long can be sampled by this method (Austin &Heyligers, 1989). Tables 1 and 1b shows the distribution of the sampled point which were used for the study. Two points were sampled from each tourism.

Table 1a

Distribution of sampled point

S/N	Sample Point	Location	Longitude	Latitude	Elevation
1.	SP 1	Kwa falls 1	$008^0\ 28^1\ 25.3$" E	$05^0\ 09^1\ 22.3$" N	14m
2.	SP 2	Kwa falls 2	$008^0\ 29^1\ 01.4$" E	$05^0\ 07^1\ 58.9$" N	18m
3.	SP 3	Tinapa 1	$008^0\ 17^1\ 15.3$" E	$05^0\ 04^1\ 26.3$" N	12m
4.	SP 4	Tinapa 2	$008^0\ 18^1\ 32.6$" E	$05^0\ 03^1\ 45.0$" N	13m
5.	SP 5	Aqua Vista 1	$008^0\ 19^1\ 04.14$" E	$04^0\ 54^1\ 42.2$" N	10m
6.	SP 6	Aqua Vista 2	$008^0\ 19^1\ 24.8$" E	$04^0\ 53^1\ 35.0$" N	08m
7.	SP 7	Iyata 1	$008^0\ 23^1\ 11.1$" E	$05^0\ 03^1\ 14.3$" N	14m
8.	SP 8	Iyata 2	$008^0\ 22^1\ 19.6$" E	$05^0\ 02^1\ 22.5$" N	13m

Source: Researchers field work

Table 1b

Location of Tourism Infrastructures

S/N	Tourism infrastructure	Location	Longitude	Latitude	Elevation	Category
1.	Kwa fall	Aningejie	$008^0\ 30^1\ 36.5$" E			
2.	Tinapa	Adiabo	$008^0\ 18^1\ 03.9$" E			
3.	Marina Resort	Marina Beach	$008^0\ 19^1\ 42.2$" E			
4.	Aqua Vista Farms	Anantigha	$008^0\ 20^1\ 08.3$" E			
5.	Iyata Resort	Iyata opposite Henshaw Town Beach	$008^0\ 19^1\ 33.4$" E			

Source: Researchers field work

Their longitude, latitude and elevations are showed in the table. Table 1b shows the location of each site in the geographical space. Their category of ownership is also shown on the table. Out of all the infrastructures shown, government owns over 60 percent of the total tourist sites. The implication of this is that government in its quest for the diversification of the economy have opened more land for tourism infrastructure than even the private sector, thereby depleting the flora diversity.

Change Detection Analysis and Questionnaire:

This was premised in the changes in area coverage of the vegetation between 1995 and 2005 (10 years interval). Land sat TM (Thematic Mapper) of 2005 with 28m Resolution was used. The map of selected tourists site in Southern Cross River State was overlaid on the imagery to subset the area of study. Questionnaire survey was used to gather information from tourists on their experience about these destination, whether they have noticed any changes due to our uses of these ecological areas.

Resident in these localities were equally interviewed to know if they are benefiting from the ecotourism programmes or not. If they are not benefiting, how do they react? Is it by penetrating the area and doing whatever they wish if only to satisfy their needs thereby impoverishing the area further? What is their relationship with the visitors who have come to their once serene environment? Their responses were presented in tables and charts with simple percentage. Participatory Rural Appraisal (PRA) was equally used to ascertain what species difficult to yet or are no longer available (Extinct, threatened or endangered). Four hundred questionnaires were distributed to the residents of the Calabar and Akamkpa tourism hotspots.

IDENTIFIED TOURISM SITES AND THEIR INFRASTRUCTURES

A: Tinapa Shopping Complex Tourism site

There are four international standard wholesale experience of 10,000m shop space each, integrated shopping complexes, four large were houses of 18,000m each where bask buyers are served, trailer parkes for the loading of trucks, retails outlets, food courts with takeaway outlets, administrative centre, parking for 3,000 cars and coaches.

LEISUE LAND/WATER WORLD:
Ware pool, standing wave surfing, lazy ride, water sliders, picnic area, children's pool and play area, tennis courts, valley ball courts, kiosk, 8 cinema hall for 1,915 viewers, 2 international standard casinos, swimming pool, water parks, and leisure rides weight machine, features for soft driving rage, a golf course and Nolly wood movie studio.

SUPPORT SERVICES AND AMENITIES
Robust power supply, ICT infrastructure, security infrastructures, man-made like with jellies, fishermen's village comprising of themed bars, a branded Night, club and Arts crafts village, 300-room hotel ware house cluster with 5 ware houses, Tinapa movie studio and ROADS. Good roads interconnection facilities.

B. Kwa Fall tourism site
Two Restaurants, concrete stair case down to he stream, one earth road and a bamboo bar.

C. Aqua vista tourism site
Five blocks of charlets, 8 fish ponds, one tarred access road by the facility, earth roads as tracks traversing the area, one administrative block children play ground, a bar, a concrete wall fence round he facility.

The description of all the tourism site is given to explain the extent of tourism infrastructure development and its implication on the flora biodiversity.

Secondary Source of Data:
Data on the number of visitors was obtained through Secondary records of making reference to Cross River State Bureau and other periodicals published by other researchers on this destination. Tourism infrastructures in the hotspots were equally obtained from the bureau.

Techniques of data analysis:
The method of analysis of species diversity and species diversity followed that defined by Bellany (2007) as adopted by Sutherland (1997) and Speller berg (1992). To be able to get the species diversity and species density from each quadrat, this formula was adopted

(a) Species density: Bellany (2007:416) defines it as the "total of number of specific species found in a specific area of a habitat for a specific time period.

$$D = \frac{n/a}{t}$$

where D = the density
n = the number of individual
a = the area studied
t = the time period which the study was conduct per unit space, villend (2010)

(b) Species diversity: According to Bellany (2007:417)
"A measurement that incorporates both and number of different species or individual types of organism, that inhabit a given location and the number of individual of each type present.
Generally it has been observed that undisturbed locations have higher species diversity than that found in similar habitats that have undergone extensive environmental alteration.
The commonly used indices are Simpson's, Shannon – wieners and the Alpha Diversity index.

$$D = \Sigma P^2 \text{ (Simpson, 1940)}$$
$$i-1/$$

The Shannon –Weiner index of diversity is expressed as

$$D = \sum_{i=1} Pi \ (\text{Log } Pi) \text{ (Pielou, 1996)}$$

Where Pi is the proportion of the species (trees specific)
This proportion is represented by $Pi = \frac{ni}{N}$
By way of contrast, if a sample had two species which were each represented by 50 individuals, then the diversity index (Sampson's) would be 0.5.

C. Species richness: This is simply the number of species. It is sometime mistaken to be referred to as species diversity (Speller berg, 1992). Whatever it is, the formula remains the same. Diversity is the measure of relative abundance of species or the way in which each species is represented by individuals.
Index is as follows:
SR = $\frac{s - i}{\log N}$ (Margaly, 1951)
SR = $\frac{S}{\sqrt{N}}$ (Menhnick, 1964)
Where SR is the index of species richness; S is the total number of species in the sample or area and N is the total number of individual. The former is particularly useful when there are very large number of individuals.

(d) Determination of Shannon Weiner Species index
To determine the Shannon Weiner species index, the formula is given as
$Hi = \sum_{i=1} P(i) \log (Pi)$
Where Hi = value of Shannon Weiner diversity
S = No of species in the community (sample plot)
Pi = the properties of species
log = Natural logarithm of P(i).

i = $\frac{\text{No. of plots which species occurs}}{\text{total number of plots samples}}$
NB: The value of Shannon – Weiner index usually falls between 1.5 and 3.5 and rarely, exceed 4.5. The researcher decided to refer to all the formulae above as a guide to which his findings should be. However, the actual formula used for he study was Shannon Weiner species indeed.

To test the (H_0) hypothesis that here is no significant relationship between infrastructure development and species loss in destination, the species indices of every transect quadrat were correlated with the distance away from the infrastructure. This is GLOBIO – model as used by UNEP (2001, 2002a, 2002b). This model according to Fonnemn, 2000, UNEP 2001:22 uses "distance to roads to measure the decline in impact of infrastructures". The statistical technique that was used to test the strength of the relationship (impact) was Pearson. Product Moment correlation analysis.
The formula is given as
$\frac{r = I \sum (n-x)(y - \hat{y})}{n \quad 6n \quad 6y}$

The researcher will then use 't' distribution table to test the null hypothesis.
Where $t = \sqrt{\frac{N - 2}{t - r2}}$

The degree of freedom is given as N = Z where N is the sample size (Number of quadrats) and at 0.05 level of confidence.

Table 2.
Number of trees at different distances from facilities at tourism sites

1.	Aqua Vista		
	Plot 1	20	15
	Plot 2	60	21
	Plot 3	100	24
2.	Tinapa		
	Plot 1	20	9
	Plot 2	60	17
	Plot 3	100	20
3.	Kwa falls		
	Plot 1	20	25
	Plot 2	60	17
	Plot 3	100	22

Source Researchers' field work

The hypothesis was tested using data from table 3 (below) while Pearson's product Moment Correlation (PPMC) was used in the analysis to find out the relationship between distance from tourism infrastructure sites and species diversity.

III. Result:

From the data in table 4b (below), the correlation between distance from infrastructural sites and species diversity is positive and statistically significant (r = 0.657);
P < 0.001).The implication of this is that as the distance away from the tourism infrastructure increases species diversity increases. The significant relationship indicates that the two variables (distance from infrastructure and species diversity) co-vary. That is the increase in species diversity as distance increases from tourism infrastructure sites.

The result from the analysis was subjected to a 't' – test using this formula thus shown in tables 4.1400 and 4b below.
Decision: from the analysis and the data in table K.146 the data was significant at 0.05 level of confidence. For this research (r.0.657; P< 0.001).
Therefore, 't' tabulated = 2.04.

Table 3

Species diversity(Shannon Winner) as distance increase from infrastructure in each tourism site.

Aqua Vista farms	10	0.003
	20	0.330
	30	0.360
	40	0.390
	50	0.420
	60	0.430
	70	0.443
	80	0.456
	90	0.469
	100	0.470
Tinapa	10	0.323
	20	0.260
	30	0.323
	40	0.386
	50	0.449
	70	0.450
	80	0.463
	90	0.476
	100	0.489
Iyaka farm	10	0.490
	20	0.170
	30	0.240
	40	0.310
	50	0.380
	60	0.450
	70	0.467
	80	0.484
	90	0.501
	100	0.500
Kwa fall	10	0.470
	20	0.470
	30	0.475
	40	0.473
	50	0.471
	60	0.350
	70	0.377
	80	0.404
	90	0.431
	100	0.430

Source: Researcher's field work

Table 4b
Result of correlation analysis between distance and species diversity.

Correlations	Distance	Species diversity
Pearson's Correlation	1	.657
Sig (2 tailed)		.000
Sum of square and cross product	3.300E4	58.930
Covariance	846.154	1.511
N	40	40
Species diversity Pearson's correlation	.657	1
Sig (2 tailed)	.000	
Sum of square and cross products	58.930	.244
Covariance	1.511	.006
N	40	40

Correlation is significant at the0.01 level (2 tailed)

Table 4b
Result of the analysis of T-test

N	Df	R	tctx	Sig	P<1	
3	30	0.65	5.27	2.04	0.05	0.001

't' calculated (5.27) >t – tabulated (2004) = reject H_0.
Therefore since he calculated value is greater than the tabulated value, the null hypothesis is rejected while the alternate is upheld. This implies that there exists a positive relationship between distance from tourism infrastructure and species diversity, meaning that there is a significant relationship between tourism infrastructure development and species loss. In other words, the further away from tourism infrastructure, the more the species diversity. ($R^2 = 0.62^2 = 0.4225$ or 42.25 percent). This hypothesis has taken care of the objective which seeks to examine the impact of tourism infrastructure development (construction) on flora diversity. It has also confirmed the concept of distance decay as stated by Tarvena Xi 2020 that "there is decrease or loss of similarity between observations as the distance between them increase" and with Hubble (2000) Neutral theory predictions that in ecology, similarity changes with distance across landscapes.

4.4 Level of infrastructure development around ecotourism sites

For the purpose of the objective stated earlier, table 5 below is used to explain the rate of disappearance of vegetation cover due to tourism infrastructural development on flora diversity statue in Southern Cross River State. Various infrastructure were identified at every site. These infrastructures were developed to makes life comfortable for those who go to the tourist sites. However the development of the infrastructure is responsible for the extent of degradation that is noticed on various tourist sites from the table 5 below. Infrastructures occupy as much as $0.035km^2$ in Aqua Vista farms, $2.81km^2$ at TINAPA and $1.56km^2$ at Kwa fall.

TABLE 5
TOURISM INFRASTRUCTURE ON THE DIFFERENT TOURIST SITES STUDIES

S/N	INFRASTRUCTURES/ SUPERSTRUCTURES	AQUA VISTA	TINAPA	KWA FALLS	TOTAL
1	Wholesales emporiums	-	2	-	2
2	Retail Outlets	-	3	-	3
3	Food courts with takeaway outlets	1	1	-	2
4	Administrative centre	1	1	-	2
5	Parking for cars and coaches	2	2	-	4
6	Wave pools	-	1	1	2
7	Lazy river ride	-	1	-	1
8	Water sliders	-	2	-	2
9	Picnic area	1	1	1	3
10	Children pool and play area	-	1	-	1
11	Tennis courts	-	1	-	1
12	Volley ball	-	1	-	1
13	Kiosks	-	1	-	1
14	Robust power supply	-	1	-	1
15	ICT infrastructure	-	1	-	1
16	Security infrastructure	1	1	-	2
17	Man-made lake	-	1	-	1
18	Aquarium	-	1	-	1
19	International casino	8	-	-	8
20	Restaurants	2	1	2	5
21	Cinema complex	-	1	-	1

22	Games arcade and bowing alley	-	1	-	1
23	Children's pool and play area	1	1	-	2
24	Fishemen village (with themed bar a branded night club and arts and craft village)	-	1	-	1
25	Hotels	1	1	-	2
26	Warehouse cluster	-	5	-	5
27	Movie studio	-	1	-	1
	Total number of infrastructures	20	35	4	59
	Land coverage (km^2)	0.035	2.81	1.56	4.405

Source: researcher's field work.

TABLE 6
MOVEMENT OF DESTINATION ATTRACTIVENESS (VISITORS EXPECTATION OF DESTINATION ATTRIBUTES)

S/N	ATTRIBUTES CONSIDERED	NUMBER OF RESPONSES (FREQUENCY)	MEAN PERCENTAGES
1	Enjoyed the whole experience	235	74.57
2	Hospitality of the people met and provided service	235	75.05
3	Attracting and appealing natural attractiveness (sceneries)	235	73.45
4	Uncrowded and unspoiled parks	235	50.77
5	Attractive animals and game	235	39.57
6	Staff being prompt	235	52.08
7	Adequate and safety facilities	235	56.57
8	Beautiful beaches	235	45.68
9	Nice cuisine and drinks	235	53.51
10	Deep sea fishing	235	21.17
11	Perfect weather and pleasant climate	234	58.09
12	Well-equipped information centre	234	45.38
13	Cultural experiences	235	63.71
14	Modern equipment and facilities	235	48.62
15	Neat parks	235	66.20
16	Ease to use facilities	235	46.33
17	Reasonable pricing	234	45.44
18	Existing business opportunity	234	43.03
19	Clean water	231	57.75

Source: Cross River State Christmas/carnival monitoring and evaluation committee report, 2010.

The implication of the list to flora diversity is that when these population visits any ecotourism site (destination) they trample on the vegetation, harvest some plants as souvenir to take home. Local people who make wooden or raffia materials will also increase their stock to meet up with the demand of the population of tourist, thereby impacting negatively on the physical environment.

Furthermore, policy makers and particularly the government will see it as a basis to increase and update facilities in the ecotourism destination, the implication being the erosion of flora diversity for land space to build infrastructural facilities. The waste generated by these tourists in the destination during this peak period has effects on the land, water and air in terms of pollution in addition to the noise pollution from both auto and human traffic.

Institutional policies such as government policies to further develop tourism can also recommend further opening up of new sites for the expansion and subsequent construction of facilities such as play grounds, roads, hotels, car parks, lawn tennis courts, emporia, offices and other sports arena with roads linking them. This was observed by the researcher in the study area where Iyata farms is coming up close to TINAPA Business and Leisure Resort. The researcher discovered that an average of 10.91 kilometers squared, representing 2.57 percent of both wetland and forest flora diversity are lost to tourism every year.

A comparative break down of the diversity index as shown in table 7, the study area indicate that the diversity index at Aqua Vista is D = 1.097; TINAPA is D = 0.360, Iyata farms (annex to TINAPA) is D = 1.091 and D = 1.0871 at Kwa falls.

TABLE 7
DISTANCE FROM FACILITIES AND FLORISTIC DIVERSITY IN EACH SITE WITHIN THE STUDY AREA

STUDY AREA	DISTANCE FROM FACILITIES (METERS)	NUMBER OF TRESS (FREQUENCY)	PERCENTAGE (%)	NUMBER OF SHRUBS (FREQUENCY)	TOTAL NUMBER OF SPECIES	SHANNON WEINER INDEX
Aqua Vista						
Plot 1	20	15	34.78	17	32	
Plot 2	60	21	32.61	9	30	
Plot 3	100	24	36.61	6	30	
			100.00		**92**	**D = 1.097**
TINAPA						
Plot 1	20	9	32.39	14	23	
Plot 2	60	17	30.99	5	22	
Plot 3	100	20	36.62	6	25	
			100.00		**71**	**D = 0.360**
IYATA FARMS						
Plot 1	20	9	27.78	11	20	
Plot 2	60	18	34.72	7	25	
Plot 3	100	21	37.5	6	27	
			100.00		**72**	**D = 1.091**
KWA FALLS						
Plot 1	20	25	36.25	4	29	
Plot 2	60	17	26.25	4	21	
Plot 3	100	22	37.5	8	30	
			100.00		**80**	**D = 1.0871**

Source: Researcher's field work

IV. CONCLUSION/RECOMMENDATION

With this low-level diversity index, it is indicative of the fact that the extent of flora diversity destruction is high. This means that only few species are able to survive the effect of the tourism infrastructure development. It is therefore evident that tourism infrastructure has to a large extent degraded the vegetation. If this situation is not controlled, there will come a time where only a shadow of the one-time rainforest vegetation will be left, thereby encouraging climate change, erosion and further degradation of the land.

The researcher therefore recommends that public policies on the rampant opening up of forest areas for the development of tourism infrastructure must be done with care to ensure that lands which are meant for other sectors are not harnessed and demarcated for ecological tourism to the detriment of rural people's means of livelihood.

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