
**DETERMINANTS OF RURAL SETTLEMENT PATTERNS AND IMPACTS ON
THE ENVIRONMENT OF SOME SETTLEMENTS OF CROSS RIVER STATE,
NIGERIA.**

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Abstract.

This paper essayed to investigate determinants of rural settlement patterns and their impacts on the environment of some communities of Cross River State, Nigeria. Two research hypotheses were formulated and tested for the study. Data were obtained using a simple community member's checklist and responded to by 400 subjects drawn from the population using stratified and purposive sampling techniques. Data obtained were tested using one-way analysis of variance (ANOVA). Results obtained showed that; natural, social and economic factors are significant determinants of rural settlement patterns in the study area and these indices of rural settlements determinants significantly influence the effects of settlements on rural environment of communities of Cross River State. It was recommended among others that government should provide alternative sources of livelihoods, and social amenities to communities so as to discourage community members from direct use of natural resources; encourage nucleation and urbanization rather than allowing each individual pursue personal rural settlement possibilities which will result to scattering or dispersal of settlements and the overall impacts over widespread rural environments that could otherwise be conserved.

Key words: Nucleated settlements, dispersed settlements, linear settlements, natural factors, socio-economic factors, agriculture, and impacts on environment.

Introduction and Background

Anywhere human beings are found is a human settlement. In the same vein, all locations in rural space can conveniently be regarded as potential sites for rural settlement. The acquisition of urban settlement status comes about only with the passage of time and continuous occupancy by an increasing number of people. Ofuoko, and Ebewore (2012)

see a settlement as a group of people living in buildings; and that it is a unit or organized group of men, women and children making a living out of their surrounding environment. These units may vary in size, complexity and stage of development.

Agabi, Abang and Animashaun, (2010) observed that rural settlements may occur at the top and bottom of a steep slope or cliff, and that, some rural areas exhibit a mixture of dispersion and nucleation in their settlement patterns. The authors cited the example of the mixed settlements along the region between Obudu Township and Obudu cattle Ranch in Cross River State, Nigeria.

Many years ago, the human population was modest and man the gatherer lived in perfect harmony with his environment. But as the human numbers began to grow in “geometric progression” man needed to cover more grounds to be able to meet his basic requirements. Rural space colonization began when new and uninhabited areas were invaded by settlers- a process of dispersal of settlements into new territories. Human settlements generally vary from village, town, city, metro pole, to conurbation to megalopolis. Though, rural settlements range in size from isolated dwellings to villages; they are found everywhere and accommodate over half the world’s population. As stressed by Agabi, et al (2010) over 75 percent of Nigerians reside in the rural areas.

The impacts of rural settlements on the environment will be implied from the generality of man’s use of the environment and the resources therein. Moreover, in several of the countless African settlements, people strive hard to eke out a living by deforesting lands that have been severally denuded and do little to resettle unused lands. These principally agrarian-based rural settlers require and provide for themselves the basic necessities of life ranging from food through clothing to shelter; all of which in effect require inputs sourced from within the environment. The rural man lives by the soil and he does not choose his settlements randomly, he knows well how to use the resources around him, and so he chooses wisely the locations that offer him the best possible advantages.

Fertile land, local land (coastline and lowland), route focus, the presence of minerals, the need for defense, river related sites, river meanders etc. Constitute the major broad-based factors considered in rural settlement types, locations and patterns. Rural settlements as much as possible are located in fertile soils, areas of adequate water supply and high grounds for purpose of security. They perform functions such as marketing and commerce, industrial, mining, administrative, educational, cultural, recreational and residential. The pattern, location and type of rural settlement give an indication of the kind of activity going on around it.

But this search for comfort and utopia by man as it then were, creates externalities in the form of wastes, deforestation, devegetation and bush burning from traditional farming practices. Excavation of hillsides for purposes of building constructions, roads, bridges among others accelerates the processes of erosion, siltation, contamination of streams, rivers, underground water and a host of other “Ecocrises”. Emielu, (2008) captured the meaning of the pattern of settlements as the relationship between one house or building and another.

Much of the topography of the study area is undulating with some mountains steeper than others. A few plains appear here and there with streams and springs transecting the landscape occupied by montane ecosystems, tropical rainforest eco-complex, mangrove ecosystem, and a touch of savanna vegetation in some older settlements. Most communities nucleate even on hilltops, whereas others disperse on plains, but others depict both nucleation and dispersal. It is only logical to study the determinants of patterns of settlements as well as the impacts of these settlements on the fragile and rural environment.

Many research studies have been carried out, and a lot of articles, books etc have been published by human settlement experts on the issue of rural settlements and pattern determinants. This research study considers holistically rural settlements patterns, their determinants and the direct and implied impacts of these settlements on not just the rural environment but the entire ecosystems of the study area.

Natural factors as determinants of rural settlement patterns:

Among the natural factors we will look at here include: topography and relief, dry land, fertile soils, availability of water and other aquatic resources, favourable rainfall patterns, adequate sunshine, availability of grassland vegetation, forests and other forest products. Emielu, (2008) identifies degree of aridity, disease, soil conditions and relief as physical conditions influencing locations and patterns of rural settlements. Vegetation, relief, soil conditions and moisture supply are only some of the natural conditions that made Yoruba settlements of Western Nigeria possible.

Ebong and Animashaun, (1992) in chronicling the influence of natural conditions on rural settlements locations and patterns stated that, different surfaces are associated with particular patterns of settlement. Smooth relief as for example, is said to favour concentrated villages (nucleated settlements) because arable land is continuous in one piece and thus permits uniform exploitation. Early settler's efforts to provide communal needs such as sinking of wells, the building of ponds and fences resulting from collective efforts of the settlers strengthen village agglomerations and make them to grow through time. In contrast to smooth relief, rugged relief is associated with dispersed settlements because arable land occurs in patches of unequal sizes which discourage communal living. Although the relationship between land surface and settlement pattern cannot be causal, empirical evidence/observations confirm that specific landforms have peculiar settlement patterns.

Ebong and Animashaun, (1992) stated as for example that, on the Obudu hills in Nigeria which of course falls within our research area, the characteristic settlement pattern is dispersal because of the ruggedness of the relief and discontinuities in spatial distribution of arable land. The dispersed farmsteads are generally located on slopes which overlook main villages and contain less than twenty people, presumably of the same familial lineage. These types of settlements due to relief are also found south-east of Abuja, North-east of Naraguta on the Jos Plateau and in the North-west of Ikom and Boki in Cross River State, Nigeria.

Dispersed settlements are made up of compounds/enclosures containing houses of a man, his wife/wives, and in some case his brothers and sisters; dispersed nature of a

settlement is a product of the gradual disintegration of nucleated settlements due to demand for farmlands and population growths, others are kinship, inheritance, historical and political ties.

Emielu (2008), Ebong and Animashaun (1992), all agreed to the effect that dispersed settlements are separate dwellings that are scattered and separated from one another and do not seem to possess any organization or form any association and often containing a few individuals. The foothills plains of Obudu, which stretch from Sankwala to parts of Ogoja, have nucleated villages. Nucleation is also characteristic of Afikpo and the Benue plains of Nigeria (Ebong and Animashaun, 1992:5). This research study agrees to the submission of these authors in the sense that, the major landforms and settlements comprising our area of study are analyzed and chronicled.

In an area of uniform distribution of resources, inhabitants are free from the restrictions and impositions of uneven distribution, and they may choose where they wish to settle, while their economic pursuits are organized around it. If uniform grounds are fertile, clusters of population are more likely to result especially if it is an agricultural community. This research work agrees with this finding to the extent that, such settlements exist in new Ikwette, Bumaji, Beebo, Bebi plains, Lishiche, Besenge, Begiagba, Obubra, Okuni, Nde-afi, Ediba etc.

The moment this uniformity gives way to uneven distribution either of topography or soil conditions, settlements tend to become dispersed as they 'scatter' into small units in search of favourable spots. This is true of Kundeve, Kanyang, Busi, Shikpeche, Afi, Bokomo, Boggo and Ketting whose settlements are dispersed. Rugged and mountainous terrain repels nucleation and, where the mountainous terrain is usually watered, the lower slopes are usually nucleated while the upper and steeper slopes are generally devoid of permanent settlements. The rugged terrain of the Cameroon –Adamawa highlands as for example has helped to establish dispersed settlements.

Relief modifies climate and favours clustered settlements- the climate of Jos and Obudu Ranch is pleasantly attractive and has attracted nucleation despite the hilly terrains. Adepeju, and Oyebola (2013) writing on the Yoruba culture contends that, to make use of the strategic physical conditions, Yoruba settlements were deliberately sited at the base or on the ledges, spurs and tops of hills or close to a wide river or surrounded by dense almost impenetrable forests. He added that, settlements evolutions are both a geographical and historical phenomenon, that there is an element of continuity in them.

Writing on the influence of shelter and aspect Agabi, et al (2010), stated that, in order to protect himself from bad weather, man seeks outlooks to sunshine for the warmth he needs, whenever it is possible, man stays away from exposed spots, usually leeward sides of ridges are preferred. Dry land and soils form another environmental factor, which influences the patterns of settlement in the rural areas. Liable marshy lands or those that suffer seasonal inundations through river floods, upstanding sites with gravelly terraces were chosen to avoid both damp and disaster (Agabi, et al 2010).

Emielu, (2008) observed that, the fertile loamy soil of Yoruba land, Kano, Kikuyuland in Kenya favoured settlements nucleation, while the swampy soils of Niger Delta and the South-east of Ghana favoured dispersed settlements. And that, where the

ground is swampy, settlements tends to search for strong grounds, likewise, where the soils are subject to flood but capable of supporting a reasonable productivity, agricultural settlements tend to nucleate on the few islands of higher protected grounds. The availability of water resources has also been found to influence rural settlement locations and patterns. Man must have access to pure drinking water. In desert or semi-arid regions, man congregated around springs or wells. These settlements are called wet-points settlements. In dry lands, settlements are concentrated in river courses example Sudan and Egypt along river Nile, Mali, Niger and Nigeria along River Niger (Emielu, 2008).

The influence of water in determining the pattern of settlements is particularly strong in arid regions; settlements nucleate around oases and artesian wells. Also, in limestone regions, settlements tend to nucleate around springs because much of the drainage is underground. Both Agabi, et al (2010), Ebong and Animashaun, (1992) agree that, the importance of water to man has always compelled man to locate his settlement in the proximity of regular sources of water supply. They contended that, success or failure of rural economy depends on availability of water; especially in regions where agriculture depends on water through irrigation.

However, Ebong and Animashaun, (1992) insist that in the humid regions, the law of water is less severe on settlement patterns, nothing that, where water supply is ubiquitous, dispersed patterns of settlements tends to emerge as in Bengal and kent. But sometimes, regions, with similar hydrologic conditions have different patterns of rural settlements. In Nigeria, the southern parts of present-day Edo/Delta states that share similar hydrological conditions with the lower plains of Cross River and Akwa Ibom State have several nucleated settlements in contrast to the latter.

Hopkins and William, (2012) confirms that rivers are not only the main force in shaping and transforming the landscape, but they also provide essential routes for exploratory, navigation and trade and plays a pivotal role in settlement location. And that since the beginning of civilization, river deltas have attracted human settlements by virtue of their rich and fertile soils, abundant water and access along navigable water ways to the seas. The Niger Delta region of Nigeria is a classic case in point. In our study area, the river Cross River has encouraged settlement nucleation along its route from Cameroon down to where it empties itself into the Atlantic Ocean at the Calabar estuary. Settlements are nucleated at Ikom, Ofon-Atam in Obubra, Itigidi and Ediba in Abi, Asange-nyong and Obio-oko (Creek town) in Odukpani and the Marina, Obutong, Bay side and Anantigha axis of Calabar South and Municipality.

Weather/climate

Weather and climate obviously influence settlement patterns and locations. As Emielu, (2008) succinctly puts it, the traditional African farmer farms and settles at the mercy of nature. As a result of low technology, he has neither the means nor the will to control nature; rainfall and other climatic factors determines his settlement pattern and his farming calendar, as well as the size of his harvest is greatly influenced by its amount, distribution as well as natural pests and diseases.

Emielu, (2008) admits that, agriculture that influences rural settlements depends largely on the amount and distribution of rainfall. The author acknowledges that, low rainfall favours few settlements and vice versa. Ebong and Amimashaun, (1992) as well as Agabi, et al (2010) advised that, though natural factors are quite influential in the determination of rural settlements, locations and patterns, a large number of non-conforming examples calls for caution and validates the need for a collaborative study of the factors necessary for settlement evolution.

Socio-cultural and political considerations in rural settlements patterns:

The socio-cultural and political developments studied along the lines of historical antecedents influence rural settlements locations and patterns as they seem to explain the differentials in the traditional present-day ethnic groupings whether dispersed or nucleated. Emielu (2008) discloses that, racial segregation especially during the apartheid era in Zambia, Zimbabwe and South Africa favoured a situation where large portions of high potential (white highlands) favoured dispersed settlements while the locals were forced to nucleate and congest in small poor areas of land.

The author subsequently reveals that, the Yoruba of South-West Nigeria by nature of their social relations prefer to live in groups, so they are mostly found living in nucleated towns or discrete village units. The Ibos on the other hand who possess a rather “republican” attitude and because of their centralized economic structure and cultural cohesiveness are found living in large numbers in dispersed settlements units to harness collective strength and security. Moreover, in colonial Africa for ease of administration and convenience, the colonialist amalgamated and integrated hitherto dispersed settlements; settlement dispersal makes administration difficult and provides little opportunities for social gatherings.

Emielu, (2008) noted that dispersal was associated with the desire for every adult male to found a separate settlement and thereby establish a name for himself since the settlement usually became named after the founder. This as well corresponds with dispersed settlements in our study area-you hear of Becheve, Besenge, Bagga, Belinge, Bebi, Basang, Bishiri, Bendi etc with B (e,I, or a) meaning children of –Ucheve, Usenge, -agga, ulinge, - ebi, isu, -usang, -ishiri respectively or you may hear of Bebuen/Bebua...in Bette and Bekwarra Etc. in the South of Cross River State, you hear of Ikot Ishie, Ikot Efanga, Ikot Ansa, Ikot Ene, Ikot Nkebre, Ikot Ekpo, Efak Queen Duke, Obio oko etc “Ikot”, “Efak” “Obio” meaning farm of...; Corner of...; country of...; etc.

Agriculture and the type of economic activities and settlement patterns and locations of rural people

The patterns of rural settlements are also tied to the conditions of agricultural progress. Emielu, (2008) posits that, the most primitive form of agriculture which bordered on hunting and gathering generally had the tendency to create dispersed settlements, possessing a weak organization roaming about in small groups searching for food. The stage of settled cultivation, which is an advance stage over hunting and gathering,

encouraged nucleation. It is the discovery of agriculture that gave rise to the first settled communities or villages.

Agabi, et al (2010) summed that, since the rural man depends solely on farming for existence, it means that he looks not just for any type of land but areas of fertile soils or rich pastures. They noted that, the significance of good farmland can be seen from the fact that, the fertile areas tend to have a far greater density of nucleated villages than infertile areas, like Ugep in Yakurr, new Ikwetle where the community moved across six communities from old Ikwette to settle because of fertile land.

Trade and economy have influenced the development of alot more rural settlements. Agabi, et al (2010) posited that, many rural settlements have developed as trading centres determined by route ways and not natural factors, some others may be located on cross roads, some strung along principal or secondary lines of communication such as a trunk roads, canal, or rail way lines, bridging point across a river are usually favoured points for settlements this being where three different means of transport can be served- road, river and ocean.

The impacts of rural settlements on the environment

Impacts on the flora and fauna of the rural environment:

The impacts of rural settlements on vegetation and forest could be inferred from the general activities of man within an environment. Among the multiplicity of impacts, we have deforestation, devegetation, desertification and drought. In the words of Hopkins and Williams, (2012), the pressure of settlements nucleation has intensified the pressure to exploit the land to the maximum-around the world. An average of 100km² of land becomes desert every year. Soil erosion, deforestation, the over –cultivation of land and changes in climate has all helped to transform once flourishing and fertile environments into barren landscape. Traditional ecosystems have irrevocably been damaged.

In arid and semi-arid regions, removing vegetation for firewood, intensive grazing of livestock and crop cultivation leads to breakdown in the soil-binding root systems of vegetation cover. And as the desert expands and once fertile areas become increasingly less fertile, indigenous plants and animals that once thrived in the area struggle for survival and eventually disappear. Hopkins and Williams, (2012) described rainforests as dense complex ecosystems, lashed by average rainfall of about 225mm per hour and endowed with fertile, often volcanic soils, rainforests abound with animal and plant life-all these favour the establishment of large settlements to exploit the rainforest. Okwangwo, Ekuri, Buanchor in Boki LGA; Akamkpa, Biase Akpabio and Bakassi in the South of Cross River, Basang, Busi, Becheve and some parts of Bisu in the Northern parts of the state settle around rainforest margins. The impact of human settlements on this eco-complex is deforestation and biodiversity loss; which culminate to several other environmental problems.

Human settlements are considered as leading to a decrease in vegetation succession or complete absence. The extent of trees which form a continuous canopy, integrating sunlight and rainfall etc has an overriding influence on the vegetation structure, forest

cover, their life cycle to maturity; natural decay and regeneration are destroyed because of continuous impacts from humans who settle in and around the ecosystems.

Peters, Ekpoh and Bisong, (2010) observed that, plants are primary producers which dominate the flow and cycling of energy, water and mineral nutrients within the ecosystems. And that, the structure of the vegetation, which other organisms live and thrive including humans are dependent partly on the type of vegetation around an environment. Man utilizes plants as renewable sources of food, medicines, fuels, clothing, shelter and a host of many other raw materials; the impact of settlement on the vegetation escalates with population explosion. The authors argue that, man influences climate, and climate is significantly controlled by the nature of the vegetation which in turn determines the nature of the soil and that these three environmental attributes- soil, climate and vegetation are strongly interwoven. The impact of man's activities on any one of them has often resulted in repercussions on others.

Plants and animals are the nonrenewable resources of our greatest concern, this is because, some rare species of plants and animals are faced with extinction, while some have already disappeared from the face of the earth due to the influence of humans settled in the rural areas housing these ecosystems. Peters, et al (2010) speculated that, if current patterns of human activities within settlements and beyond continue; many species will vanish even before they are discovered. The international Union for Conservation of Nature (IUCN) estimates that, an average of one species or sub-species of higher animal is lost each year. Over all, roughly, 100 birds and mammals are now in jeopardy and that a disappearing plant can take with it ten to thirty dependent species such as insects, higher animals and even other plants.

The impacts of human settlements on the environment motivated the IUCN to declare as endangered – five species of mammals, six insect's species, eight primates, two rodent species, fourteen carnivore species, three species of seals, elephants, eleven artiodactyl species, three crustacean species, five species of reptiles, eight avian species among others. Human activities like bush burning according to Ambe, Eja and Agbor (2015) destroys not just vegetation cover but the nesting sites, breeding, spawning and feeding grounds of avian species; settlements disturb their aerial pathways and tilt them towards extinction. Lawal, Aniah, Uche and Animashaun, (2010) analyzed the relationship between human activities of deforestation, poaching, cultures and hunting etc to wildlife conservation. They indicted rural settlements as the major culprit in wildlife depletion/extinction. Animals are either killed, maimed or displaced, browse, rodent, insects and other populations changes. Other human activities from rural settlements impacting on wildlife include hunting, poaching and new habitat creation.

Impacts of rural settlements on landforms and soils of the ecosystems

The impacts of human settlements on the environment may include; changes in land use, especially as regards deforestation, afforestation and strive towards urbanization, mining and associated activities, construction of roads as well as agricultural practices. Destructive elements such as creep and rain wash are restricted by the climax vegetation cover but due to human settlement activities, this vegetation cover is removed exposing the soil to

destructive elements. And that agricultural land with its highly modified standing crop commonly has erosion rates five times than natural level.

Wind erosion decreases soil quality and the underlying parent material alongside the geological systems breakdown. Traditional agricultural practices have rendered farmlands virtually and ecologically bleak. We realize that, as the human race continues to increase its numbers; so, villages, towns, cities, continue to expand and multiply, the more land used for human shelter, the less there is for food production, conservation/protection etc. this is called “settlement encroachment”.

Hopkins and Williams (2012) submits that humans have irrevocably transformed the surface of the planet because of settlements; mammoth engineering structures, vast opencast mines and complex transport infrastructure all leave indelible imprints on the land. Emielu, (2008) elaborated that, shifting cultivation- the rudimentary system of farming of farming involves cultivating an area until all the available farm sites convenient to the settlement are used; further cultivation he said would yield very meager returns because the soil is no longer fertile. The whole settlement moves in search of a new site around which the farming would resume. It though may be cleared again if the settlement returns. On the whole, the impacts of rural settlements on land forms and soils could be classified under-slope instability, stream bank/shore instability, erosion, sedimentation, soil structure defect, organic matter/nutrients loss, soil flora and fauna loss and laterization.

Impacts of settlements on climate and air quality of the environment

Environmental problems they say “know no international regional or local boundaries. “This is truer with regards to issues of climate, weather and air quality. Agabi, et al (2010) admits that, with the intensification of rural land use and the changes in vegetation cover, atmospheric elements such as moisture, temperature and heat transfer are affected. They noted that even urban air could have widespread effects of pollution by wind and precipitation over a wide range/area. As the rural settlements nucleate towards townships, temperatures tend to increase because urban centers are usually hotter when compared to rural areas. This, the authors suggest is because, the urban areas have tall and darker buildings, paved streets which attract and maintain heat for a longer time, giving rise to the phenomenon called “heat islands”. In most cases, the effects of the industries impact upon clouds, rain and other associated weather hazards like hail, thunder etc.

Eja, (2003) confirms that, air pollution affects weather elements like rainfall, smog, and heat balance and that, although they are natural sources of air pollution like volcanic eruptions, earthquakes etc air pollution results largely from anthropogenic sources-classified as mobile or stationary within settlements. Apart from virtually intrusive effects of motorways and airports on a landscape, their pollutants nature has made them the target of wider opprobrium.

Settlements reflect themselves on the environment; both rural and urban alike, the micro and regional climates are affected in the area of temperature changes, relative humidity, wind direction and wind speed as well as atmospheric pressure. Activities resulting from human settlements produce and raise dust, smoke as well as other emissions, which result in cumulative changes in carbon dioxide and albedo. The tropical rainforest

naturally sequesters excess carbon, but the worst-case scenario presents itself when the rural environments are now bereft of rainforests.

Impacts of settlements on water, and aquatic resources of the environment

It is an established fact that rural settlements seek after locations with water as a resource and other aquatic resources. Water is one of the most important elements in nature and in the human society (Peters, Ekpoh and Bisong, 2010). More than one use is made of water by man-it is required for domestic purposes, for livestock, irrigation, hydro-electricity generation, dilution and disposal of wastes, cooling thermal power stations, fishing, recreation and navigation. It is these numerous uses of water by man that brings about the effects humans in rural settlements have on the liquid of life.

Peters, et al (2010) listed the many sources of water to include; streams, rivers, seas, oceans, lakes, wells, ponds, rain snow, sleet, hail, fog, dew and ground water. The hydrological cycle involves the unending circulation of water from land to the sea surfaces. Since the water budget remains constant, only its state and quality changes, as demands for water increases, the tendency for man to pollute it at one stage or another is very high.

NEST (2003), identified eight major water pollution sources in Nigeria to include, domestic sewage and other oxygen demanding wastes, plant nutrients, infectious disease agent, industrial effluents, and eroded sediments, other solid waste and petroleum products. Ukpong, Ntia, Obot and Usang (2010) clarified those communities who settle along riverine areas dump their household waste into rivers. As Emielu, (2008) observed, as an occupation, fishing is widespread along the coastal areas- the movement of fishermen in rivers and lakes has been on canoes propelled by paddles but modernization has brought about engines and even trawlers which capture everything along its path, spill petrochemicals into water bodies and pollute them.

Statement of the problem

Conflicting stories exist about the evolution of the settlements of Cross River people. Some say the settlements emerged as a result of the search for good farmlands by the people; another version holds that, the settlements converged around mountains, hillsides and rocks for the sake of security; whereas, others say that, the reasons for isolated dwellings at the middle of the wilderness and valleys of remote-in-accessible areas is because of the need for abundant game available for hunting. The strength of the problem lies in the question asked by Ebong and Animashaun, (1992) thus “are the locations of human settlements large or small merely chance outcomes of history in which settlements occur in some apparently senseless manner, or is there a recognizable order in their pattern and spatial distribution? What impacts have these settlements on the rural environment?

Statement of hypotheses

The following hypotheses are posed to guide the study:

1. Natural, Social and economic indices are not significant determinants of formation of rural settlement patterns in Cross River State.

2. Natural, social and economic determinants have no significant influence on the magnitude of impacts of settlements on the environment.

Methodology

The survey research design is used in this study; because a small representative sample was used to draw inferences from and generalizations to a population that would have been too expensive and cumbersome to study as a whole. The population of the study comprises all the rural inhabitants of Cross River State, Nigeria. The state has an estimated population of 2,892,988 people (NPopC 2006). Four hundred and fourteen (414) persons from eighteen communities, one community per LGA and 23 persons per community were sampled for this study using stratified and purposive sampling techniques.

The instrument employed for data collection is a rural settlements patterns and impacts on the environment assessment scale checklist/ questionnaire (RSPASCQ). The questionnaire is made up of two sections “A” and “B”. Sixty-Seven items were drawn up and administered to respondents. The questionnaire was administered to the respondents during weekends spanning a period of six months. Only 400 questionnaires were responded to and returned for data analysis.

Results and discussion

Hypothesis one: Natural, social and economic indices are not significant determinants of formation of rural settlement patterns in Cross River State. The result of the analysis of data on the hypothesis is presented in table 1.

Table 1: One-way analysis of variance of the influence of Natural, social and economic indices as determinants of formation of rural settlement patterns of Cross River State. N = 400.

Determinants of settlements		Sum of Squares	Df	Mean Square	F	Sig.
Social indices	Between Groups	1501.055	2	750.528	1688.709	.000
	Within Groups	176.442	397	.444		
	Total	1677.497	399			
Natural indices	Between Groups	86.678	2	43.339	.	.
	Within Groups	.000	397	.000		
	Total	86.678	399			
Economic indices	Between Groups	1171.440	2	585.720	.	.
	Within Groups	.000	397	.000		
	Total	1171.440	399			

*significant at .05, df = 2 and 397, critical f = 3.09

The outcome of the analysis on table 1 shows that the calculated f value of 1688.709 is higher than the critical f value of 3.09 at .05 level of significance with 2 and 397 degree of freedom. This implies that the null hypothesis is rejected while the alternate

hypothesis which states that natural, social and economic indices are significant determinants of formation of rural settlement patterns in Cross River State is upheld.

This finding is in line with Agabi, et al (2010) who summed that, since the rural man depends solely on farming for existence, it means that he looks not just for any type of land but areas of fertile soils or rich pastures for establishing his settlements. The findings also agree with Emielu, (2008) who noted that settlement dispersal was associated with the desire for every adult male to found a separate settlement and thereby establish a name for himself since the settlement usually became named after the founder. And also stressed that rugged and mountainous terrain repels nucleation and that in East Africa, where the mountainous terrain are usually watered, the lower slopes are usually nucleated while the upper and steeper slopes are generally devoid of permanent settlements. The finding also agrees with Hopkin and Williams (2012) who observed that destructive elements such as creep and rain wash are restricted by the climax vegetation cover but due to human settlement activities, this vegetation cover is removed exposing the soil to destructive elements. And that agricultural land with its highly modified standing crop commonly has erosion rates five times than natural level.

Table 2: Fishers LSD post Hoc Test of the influence of natural, social and economic indices as determinants of the formation of rural settlement patterns of Cross River State.

Indices of rural settlements			Mean Difference	Std. Error	Sig.
Social	7.00	8.00	5.00000*	.09750	.000
		10.00	3.66332*	.07572	.000
Natural	8.00	7.00	-5.00000*	.09750	.000
		10.00	-1.33668*	.09077	.000
Economic	10.00	7.00	-3.66332*	.07572	.000
		8.00	1.33668*	.09077	.000

*The mean difference is significant at .05 level of significance.

Fishers Least significance difference (LSD) was used to further identify where significant difference among the indices that most influence the formation of rural settlements was highest in terms of mean difference. The results presented on table 2 show that the mean difference between social and natural indices showing 5.00000* was highest while the least mean difference is between natural and economic indices which was 5.00000*.

Hypothesis two: Natural, social and economic determinants have no significant influence on the magnitude of impacts of rural settlement on the environment of rural Cross River State. The result of the analysis of this hypothesis is presented on table 3.

Table 3: One-way analysis of variance of the influence of Natural, social and economic determinants on the magnitude of impacts of rural settlement on the environment of rural Cross River State. N=400

		Sum of Squares	df	Mean Square	F	Sig.
Natural determinants	Between Groups	86.678	2	43.339	.	.
	Within Groups	.000	397	.000		
	Total	86.678	399			
Social determinants	Between Groups	1677.498	2	838.749	.	.
	Within Groups	.000	397	.000		
	Total	1677.498	399			
Economic determinants	Between Groups	857.469	2	428.734	542.111	.000
	Within Groups	313.971	397	.791		
	Total	1171.440	399			

*significant at .05, df = 2 and 397, critical f = 3.09

The result of the analysis presented in table 3 shows that the calculated f value of 542.111 is higher than the critical f value of 3.09 at .05 level of significance with 3 and 397 degrees of freedom. This implies that the null hypothesis is rejected. Therefore, natural, social and economic determinants have significant influence on the magnitude of impacts of rural settlement on the environment of rural Cross River State.

This finding agrees with Aniah, Uche and Animashaun, (2010) who analyzed the relationship between human activities of deforestation, poaching, cultures and hunting etc to wildlife conservation. They indicted rural settlements as the major culprit in wildlife depletion/extinction. Animals are either killed, maimed or displaced, browse, rodent, insects and other populations changes. Other human activities from rural settlements impacting on wildlife include hunting, poaching and new habitat creation.

Table 4: Fishers LSD post Hoc Test of the influence of natural, social and economic determinants on the magnitude of impacts of rural settlement on the environment of rural Cross River State.

Determinants of rural settlements	Joint	Magnitude of impacts	Mean Difference	Std. Error	Sig.
Natural	68.00	73.00	1.58571*	.10768	.000
		78.00	-2.00000*	.11033	.000
Social	73.00	68.00	-1.58571*	.10768	.000
		78.00	-3.58571*	.10898	.000
Economic	78.00	68.00	2.00000*	.11033	.000
		73.00	3.58571*	.10898	.000

*The mean difference is significant at .05 level.

Fishers Least significance difference (LSD) was used to further identify where significant difference among determinants of the magnitude of impacts of rural settlements on the

environment was highest in terms of mean difference. The results presented on table 4 show that the mean difference between social and economic determinants which is 3.58571* was highest while the least mean difference is between natural and social determinants which was -2.00000*.

Conclusion/ Recommendations

It was concluded that, social, natural and economic indices either singly or in a combination determine rural settlements types, patterns and locations. And that rural settlements have significant impact on the rural environment.

It was recommended that, government should provide alternative sources of livelihood and social amenities to communities to discourage community members from direct use of resources and that reserve areas should be created with all social amenities to avoid every individual from seeking to settle where they like.

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