

The Impact Of Road Network And Spatial Structures On Nodal Environmental And Architectural Aesthetics: A Case Study Of Abakaliki Metropolis, Ebonyi State, Nigeria

Arc. Edokpolo, .L.O.

Department of Architecture, Ambrose Alli University,
Ekpoma, Nigeria

TPL. Edigan B.I

Department of Urban and Regional Planning, Auchi
Polytechnic, Auchi, Nigeria

Engr. Dr. Amadi, C.O

Department of Civil Engineering, Ambrose Alli University,
Ekpoma, Nigeria

Abstract: This study aimed at examining the impact of road network and spatial structures on nodal environmental and architectural aesthetics in Abakaliki Metropolis of Ebonyi State, Nigeria. The study considered concepts in road architecture, landscaping, spatial structures, urban aesthetics and future implications for transport, tourism and development. It revealed that the condition of some of the roads within the metropolis in particular, initially added nothing to boost the environmental and architectural aesthetics of the capital. Many roads within the metropolis have now been reconstructed. The nodes were designated as N1, N2, N3, N4, N5 and N6. The node that had the highest aesthetics was N4 with a value of 18.75. The Second highest aesthetic node was N3 (18.07) and this was closely followed by N6 (17.47). N5, N2 and N1 were rated 4th, 5th and 6th with 16.86, 16.55 and 16.21, respectively in terms of environmental and aesthetic values. This also accounted for the existing spatial structures which were determined by Olua (2017) to follow the same ranking. It therefore concluded that the environmental and architectural aesthetic values were relatively high with only a node having a fair rating.

Keywords: environmental aesthetics, architecture, urban planning, road network, flyover bridges, ebonyi.

I. INTRODUCTION

Architecture is an art form that is bound up with utilitarian, technical, and economic considerations and with the "sense of place" and physical conditions of a site. Architecture is thus often described as a balancing and coordination of environmental aesthetics, functions and technological considerations (Bannon, 2011). Environmental aesthetics has developed as a sub-field of Western philosophical aesthetics only in the last forty years; it has historical roots in eighteenth and nineteenth century European and North American aesthetics. In these centuries, there were important advances in the aesthetics of nature, including the emergence of the concept of disinterestedness together with

those of the sublime and the picturesque, as well as the introduction of the idea of positive aesthetics (Beardsley, 1958). These notions continue to play a role in contemporary work in environmental aesthetics, especially in the context of its relationship to environmentalism.

In the West, the first major philosophical developments in the aesthetics of nature occurred in the eighteenth century. During that century, the founders of modern aesthetics not only began to take nature as a paradigmatic object of aesthetic experience, they also developed the concept of disinterestedness as the mark of such experience. Over the course of the century, this concept was elaborated by various thinkers, who employed it to purge from aesthetic appreciation an ever-increasing range of interests and associations.

According to one standard account (Stolnitz 1961), the concept originated with the third Earl of Shaftesbury, who introduced it as a way of characterizing the notion of the aesthetic, was embellished by Francis Hutcheson, who expanded it so as to exclude from aesthetic experience not simply personal and utilitarian interests, but also associations of a more general nature, and was further developed by Archibald Alison, who took it to refer to a particular state of mind.

The concept was given its classic formulation in Immanuel Kant's *Critique of Judgment*, in which nature was taken as an exemplary object of aesthetic experience (Beardsley, 1958). Kant argued that natural beauty was superior to that of art and that it complemented the best habits of mind. It is no accident that the development of the concept of disinterestedness and the acceptance of nature as an ideal object of aesthetic appreciation went hand in hand.

The clarification of the notion of the aesthetic in terms of the concept of disinterestedness disassociated the aesthetic appreciation of nature from the appreciator's particular personal, religious, economic, or utilitarian interests, any of which could impede aesthetic experience (Bannon, 2011).

The theory of disinterestedness also provided groundwork for understanding the aesthetic dimensions of nature in terms of three distinct conceptualizations. The first involved the idea of the *beautiful*, which readily applies to tamed and cultivated European gardens and landscapes. The second centered on the idea of the *sublime*. In the experience of the sublime, the more threatening and terrifying of nature's manifestations, such as mountains and wilderness, when viewed with disinterestedness, can be aesthetically appreciated, rather than simply feared or despised. These two notions were importantly elaborated by Edmund Burke and Kant. However, concerning the appreciation of nature, a third concept was to become more significant than that of either the beautiful or the sublime: the notion of the *picturesque*. Thus, by the end of the eighteenth century, there were three clearly distinct ideas each focusing on different aspects of nature's diverse and often contrasting moods.

One historian of the picturesque tradition (Conron 2000) argues that in "eighteenth-century English theory, the boundaries between aesthetic categories are relatively clear and stable". The differences can be summarized as follows: objects experienced as beautiful tend to be small and smooth, but subtly varied, delicate, and "fair" in color, while those experienced as sublime, by contrast, are powerful, vast, intense, terrifying, and "definitionless". Picturesque items are typically in the middle ground between those experienced as either sublime or beautiful, being complex and eccentric, varied and irregular, rich and forceful, and vibrant with energy (Nayak and Hazra, 1992).

Within philosophical aesthetics itself, the renewed interest in the aesthetics of nature was also fueled by another development: the publication of Ronald Hepburn's seminal article "Contemporary Aesthetics and the Neglect of Natural Beauty" (1966). Hepburn's essay helped to set the agenda for the aesthetics of nature in the late twentieth century. After noting that by essentially reducing all of aesthetics to philosophy of art, analytic aesthetics had virtually ignored the natural world, Hepburn argued that aesthetic appreciation of

art frequently provides misleading models for the appreciation of nature.

However, he nonetheless observed that there is in the aesthetic appreciation of nature, as in the appreciation of art, a distinction between appreciation that is only trivial and superficial and that which is serious and deep. He furthermore suggested that for nature such serious appreciation might require new and different approaches that can accommodate not only nature's indeterminate and varying character, but also both our multi-sensory experience and our diverse understanding of it. By focusing attention on natural beauty, Hepburn demonstrated that there could be significant philosophical investigation of the aesthetic experience of the world beyond the artworld. He thereby not only generated renewed interest in the aesthetics of nature, he also laid foundations for environmental aesthetics in general as well as for the aesthetics of everyday life. The environmental aesthetics of most urban settings depends on the road architecture as well as nature and types of buildings (Bell, 1999).

Road architecture is even more emphatically tied to a locality and concrete conditions. This makes specific demands of technical design, safety, visibility, and lighting. Since aesthetic considerations must be incorporated into these premises, the potentials for variation are limited. Road architecture is moreover distinctive in that much of its aesthetics is dictated by the surroundings themselves. Creating road architecture consists in seeing and understanding these qualities and incorporating them into our aesthetic experience of the road. Proper road projects and road architecture in a modern sense first emerged in Denmark in 1761, when Frederik V decided to establish a national network of main roads. Since there was no local expertise, road engineers were brought in from France to construct the modern thoroughfares of the day.

These new, almost ruler-straight royal roads, which were laid out mainly on the island of Zealand, were built according to the period's principles for military roads, high in the terrain. Almost a century passed before this network was completed. In addition to main roads, a number of new secondary roads were laid out according to the same principles at the same time (Nayak and Hazra, 1992).

The Road Ordinance of December 13, 1793, Denmark's first compilation of road legislation, contained regulations on how roads were to be laid out – their structure, cross-section, alignment, etc. The ordinance also contained rules on road equipment. Trees were to be planted along the new roads to protect travelers against wind and weather. This is the origin of many of the roads that were planted with rows of trees to provide shade and guide travelers. These roads characterized the Danish landscape until the 1950s, when increasing vehicular traffic required wider thoroughfares, making it necessary to cut down trees. This sparked a major debate for and against roadside trees, a debate that is still going on. City streets also gained new architectural importance. The goal was to create more beautiful cityscapes and streets, and as a whole improve the urban milieu. Other factors were also including in this planning, for example improving traffic safety. Both the road's own history and that of its surroundings may be taken

into account in choosing the right architectural design (Black, 1997).

Before examining the potential impact of road developments on aesthetic sensibilities, the challenge of translating aesthetic considerations into design principles that can be used by road planners warrants comment. It is now becoming more widely accepted that an understanding of ecology is essential for environmental planning in the larger, regional landscape (Arntzen and Brady 2008). Stemming from that acceptance is a growing recognition of the fact that human respect for the biophysical determinants of any given physical setting is a major consideration in attaching aesthetic value to a landscape or to any structure, such as a road, that is introduced into that landscape.

A well-designed road fits in well with its surrounding landscape because its design reflects the principles of regional landscape design. These principles can and should be applied whether or not the area being considered is one of special physical beauty. Their observation will serve to minimize not just the visual disturbance to the landscape but also the disturbance to the physical functioning of the natural and human ecosystems. In fact, if applied well, they can contribute to the enhancement of environmental benefits. To the extent that a road's design is successful in reflecting these principles, it should prove to be aesthetically more appealing (Berleant, 1978).

Negative aesthetic impacts can be expressed as a product of the poor consideration of the above-mentioned design principles and a resulting lack of harmony between the road and various features of the landscape, such as those listed below (Costa, 1975; De Ploey and Yair, 1985; Dickinson and Tracy, 1989; Dunne, 1988; Dunne and Dietrich, 1982;

- ✓ The natural relief and morphology of the landscape. In this case, such disharmony can occur if the route does not follow the relief as closely as possible and causes the formation of major cut and fill zones, out of character with the terrain in height, length, and incline of slopes; or if the route cuts transversely or diagonally across a system of parallel valleys; or does not avoid landscape with an uneven relief.
- ✓ The hydrology -e.g. if road construction results in rerouting and channeling of a waterway.
- ✓ Vegetation-e.g. if the road project results in deforestation, destroys or does not bypass isolated trees, avenue trees, or hedges; or if it interrupts the continuity of vegetation in a valley or other setting.
- ✓ The structure and pattern of the landscape. If the road distorts the existing field system by, say, cutting obliquely through a rectangular farm system and creating numerous isolated plots which may be difficult to cultivate, out of place, and thus aesthetically disturbing.
- ✓ Urban or village areas - e.g. if the road separates two urban centers or if a strong existing urban pattern has not been taken into consideration in its design. Roads can also modify the way a city or village evolves and expands and can encourage new urban expansion. This may be an objective of road development or an unexpected outcome with undesired visual and community impacts.

- ✓ Recreational areas - e.g. if these areas, which will require good access, are not traversed with sensitivity; and finally.
- ✓ Architectural or cultural heritage-e.g. if the road crosses through a park of historical interest or blocks or cuts off a view of archaeological or cultural interest. A landscape analysis can help to define features of the landscape, using available cartographic and photographic documents and tours of the site. In order to facilitate comprehension by the public, the tools used are mainly visual.

They may include one or more thematic maps, depending on the dimension of the site and its complexity (e.g. relief maps, maps of urbanization, vegetation, landscape, and main features, as well as maps that provide a synthesis of all major road and landscape design factors. Particularly valuable in terms of regional landscape design are maps of special influence areas located in the travel corridor. Schematic cross-sections to explain the structure of the landscape and the distribution of its various components in relation to the relief; and photographs, usually arranged by landscape unit or theme to support the analysis. Consultations should be held with local communities to obtain the information suggested by the regional design guidelines. This should assist the road planners in refining the alternative alignments.

The road alignment, or the various alternatives under consideration, can then be integrated into this initial landscape using maps with route alternatives superimposed over the current environmental state; photomontages that use photographs taken on-site, or oblique aerial photographs, to simulate the road's route and impact; and analyses of the vertical alignment and cross-sections where the contour of the natural terrain coincides with that of the road's route. In this way it is possible to visualize the importance of cut and fill zones.

II. AIM AND OBJECTIVES OF THE STUDY

The aim of this study was to assess the impact of road network and spatial structures on nodal environmental and architectural aesthetics in Abakaliki metropolis, Ebonyi State. The objectives were to:

- ✓ Identify the routes, spatial structures and nodes (settlements);
- ✓ Determine the degrees of the impact of the routes and spatial structures on nodal environmental and architectural aesthetics and
- ✓ Determine the implication of the results for future transport planning in the area.

III. THE STUDY AREA

Ebonyi State is located within the partially modified low rain forest and wooded/ grassland derived savannah. The State lies approximately within Longitude 7°30' and 8°30'E and Latitude 5°40' and 6°45'N, situated within the Warm-Humid Equatorial climatic belt. The area is characterized by high relative humidity of about 75% and surface temperature of about 27° to 30°C. The mean temperature in the hottest period

of February to April is about 87°F. The rainy season begins between March 1st and March 11th and ends between November 8th and November 18th. Average length of rainy season is between 250 to 270 days in a year. The mean annual rainfall varies between 1750mm in the Northern part of the state to 2250mm in the Southern part (FDALR 1985).

Ebonyi State falls within the *Asu-River Geologic Group (Lower Cretaceous), Eze-Aku shale formation and Nkporo Formations*. The State is made up mainly of *hydromorphic soils* which consist of reddish brown gravely and pale coloured clayey soil, shallow in depth, and of shale parent material. The topography is largely a table land; highest point 162m and lowest 15m above sea level. The state lies within the cross River Drainage Basin. Major rivers in the state are the Eastern and Western Ebonyi Rivers which are tributaries of Cross River. All other rivers and streams are tributaries of these two Ebonyi Rivers. Existence of groundwater in parts of the state varies and is seriously influenced by the local geology.

While the greater part, which includes the Abakaliki Metropolis, Onueke, some parts of Afikpo north and their environs record reduced groundwater yield to hand dug well and boreholes due to the underlying aquiclude. Other locations have good to fair groundwater yield to hand dug well and boreholes (some parts of Afikpo, Ezzamgbo, Nkalagu and environs). Ebonyi State is located within the partially modified lowland tropical rain forest and wooded grassland derived savannah. It has a total forest reserve of about 1478.98 hectares. Total area presently occupied by forest is 646.96 hectares.

The state occupies a land area of approximately 5,935 Square kilometers. It is made up of 138 communities, grouped into 64 Development Areas, 13 Local Government Areas, 6 Federal constituencies and 3 Senatorial zones. The people of Ebonyi state are predominantly Ibos and belong to what anthropologists refer to as the North-eastern Igbo group and the Kwa Linguistic subfamily of the Niger-Congo. They Speak Central Igbo and variants of the central Igbo, with about 22 sub-cultural groups. The population by 1996 census figure is 2,173,501 persons, comprising of 1,040,984 males and 1,132,317 females. With an annual growth rate of 2.8 % the projected population is now 2,495,316 persons with a population density of approximately 420/km².

The pattern of human settlement is Predominantly Dispersed in the northern axis and Nucleated in the Southern part. The Major metropolitan towns are Abakaliki and Afikpo, whereas the emerging urban centres include Effium, Nkalagu, Ishiagu, Okposi, Onueke, Uburu, Ezzamgbo, Amasiri, Onicha, Akeze and Ebaunwana.

The inhabitants depend mainly on primary economic activities. Approximately 85% of the state population depends on agriculture for their livelihood. The agricultural production include: livestock and crops produced at both subsistence and export levels. Major crops for national and international markets are Rice, cassava and yam.

IV. METHODOLOGY

The study employed the aesthetic matrix for nodal environmental and architectural aesthetics. Individual nodal aesthetic values (as they affected the existing or proposed road networks) were measured and recorded in the matrix. The matrix was powered to the elicited average values of nodal environmental and architectural aesthetics. Three classes of values were used. They included:

- ✓ High: 16.40 and above
- ✓ Fair: 15 -16.40
- ✓ Poor: 0-16

V. RESULTS AND DISCUSSIONS

A. RESULTS

Line of Assessment	N1	N2	N3	N4	N5	N6	Total
N1	2.50	2.64	2.90	3.00	2.70	2.80	16.54
N2	2.48	2.52	2.80	2.90	2.55	2.72	15.97
N3	2.75	2.78	2.92	3.00	2.80	2.85	17.10
N4	2.88	2.90	3.25	3.40	3.00	3.20	18.63
N5	2.73	2.81	3.00	3.20	2.86	2.90	17.50
N6	2.87	2.90	3.20	3.25	2.95	3.00	18.17
Total	16.21	16.55	18.07	18.75	16.86	17.47	103.91

Source: Researchers' Computer output, 2017 (value divided by 1000).

Table 1: Powered Matrix for Environmental and Architectural Aesthetics

Node	Linkage	Aesthetic Value	Rank
N1	water works/ Gunning/ Nsugbe	16.21	6
N2	water works/Ogoja road	16.55	5
N3	Government House	18.07	2
N4	Onwe road/ Ogoja road/ Ezza road/Kpirikipiri road	18.75	1
N5	Ezza road/ Enugu-Abakaliki road	16.86	4
N6	Afikpo road/ Abakaliki- Enugu road	17.47	3

Source: Researchers' Computation, 2017 (curled from Table I)

Table 2: Hierarchy of Nodal Environmental and Architectural Aesthetics in Abakaliki Metropolis

B. DISCUSSIONS

EVALUATION OF THE DEGREES OF ENVIRONMENTAL AND ARCHITECTURAL AESTHETICS OF ROUTES, SPATIAL STRUCTURES AND NODES (SETTLEMENTS) IN ABAKALIKI METROPOLIS

From Tables I and II, the node that had the highest aesthetics was N4 with a value of 18.75. The Second highest aesthetic node was N3 (18.07) and this was closely followed by N6 (17.47). N5, N2 and N1 were rated 4th, 5th and 6th with 16.86, 16.55 and 16.21, respectively in terms of environmental and aesthetic values. This also accounted for the existing spatial structures which were determined by Olua (2017) to follow the same ranking.

The condition of some of the roads within the metropolis in particular, initially added nothing to boost the environmental and architectural aesthetics of the capital. Many roads within the metropolis have now been reconstructed. Some of the previously bad roads were: Obi Street, linking Afikpo street at Abakaliki's urban area, not far from the Government House; Afikpo street itself, which connects the Ogoja road, formerly riddled with potholes, with no touch of maintenance whatsoever for some years. Ogoja road which links Onu ebonyi and Enugu/Abakaliki Express way; Water works road which links CAS with Ogoja road. Major nodes along Water works road include water works/Gunning/Nsugbe (N1) and water works/Ogoja road (popularly called Union Bank junction) (N2);

Government House (N3) where Ogoja road joins Prisons road; Onwe road/ Ogoja road/ Ezza road/Kpirikpiri road (N4); Ezza road/ Enugu-Abakaliki road (N5); Afikpo road/ Abakaliki-Enugu road (N6); The Oshiri to Ezanma road; Ogbaga road project; section of the Enugu/Abakaliki expressway, which is a federal road; Akanu Ibiam Flyover, along the Trans Sahara Highway (formerly known as Spera In Deo Junction) through the International Market; Flyover at Presco Junction along Enugu/Abakaliki Expressway; Flyover at the International Market.

IMPLICATION FOR FUTURE TRANSPORT PLANNING IN ABAKALIKI

Flyover Bridges will enhance business and market activities in the town. The flyovers would make for free flow of traffic through the state capital, linking the neighbouring states. Before now, Akanu Ibiam Junction which situates at the heart of Abakaliki by Trans- Sahara International Highway and formerly known as Spera In Deo Junction used to be a nightmare for not only motorists but residents of the state. Apart from the traffic gridlocks that sometimes occur in the area, it was also a death trap for both pedestrians and motorists with myriad of road mishaps recorded in the area. With the construction of the flyover bridge at that road network node, the number of accidents will be drastically reduced.

The introduction of street lights, powered by both solar energy and normal EEDC electricity supply, will enhance degree of lighting around all road networks and nodes, especially in the night. This will create beauty and security in the affected areas and encourage transporters and other road users (Arntzen and Brady 2008).

VI. CONCLUSION AND RECOMMENDATIONS

This paper has attempted an examination of the environmental and architectural aesthetics of road network in Ebonyi State. Furthermore, it has examined the parts played by spatial structures and nodal development on the aesthetic values. This study showed that the environmental and architectural aesthetic values were relatively high with only a node having a fair rating. Finally, it needs to be emphasized that this study has only looked at the micro-level of analysis considering just the road network and spatial structures. Perhaps, other factors such as accessibility as well as the

effect of these environmental and architectural aesthetic values on nodal accessibility should be considered by future researchers in the State. New roads should not be located within the travel corridor until all special influence areas have been located and defined as far as possible.

These areas, representing unique recreation, scenic, natural aesthetic and historic values, are the most powerful aesthetic influences on road location within the corridor. This is in line with the principles of sustainable architecture (Opra, 2011).

REFERENCES

- [1] Arntzen, S. and Brady E., (ed.), 2008, *Humans in the Land: The Ethics and Aesthetics of the Cultural Landscape*, Oslo: Oslo Academic Press.
- [2] Bannon, B. E., 2011, "Re-Envisioning Nature: The Role of Aesthetics in Environmental Ethics," *Environmental Ethics*, 33: 415–436.
- [3] Beardsley, M. C., 1958, *Aesthetics: Problems in the Philosophy of Criticism*, New York: Harcourt, Brace & World.
- [4] Bell, S., 1999, *Landscape: Pattern, Perception and Process*, London: Routledge.
- [5] Berleant, A. 1978, "Aesthetic Paradigms for an Urban Ecology," *Diogenes*, 103: 1–28.
- [6] Black, P.E. 1997. Watershed functions. *Journal of The American Water Resources Association*, 33(10): 1–11.
- [7] Costa, J. E. 1975. Effects of agriculture on erosion and sedimentation in the Piedmont Province, Maryland. *Geological Society of America Bulletin* 86:1281–1286.
- [8] De Ploey, J., and A. Yair. 1985. Promoted erosion and controlled colluviation: A proposal concerning land
- [9] Management and landscape evolution. *Catena* 12:105–110.
- [10] Dickinson, J., and F. Tracy. 1989. Stream corridors in watershed management. Prepared for Agency for
- [11] International Development, DESFIL, Washington, DC, 17 pp.
- [12] Dunne, T. 1988. Geomorphologic contributions to flood control planning. Pages 421–438 in V. R. Baker, R.C.Kochel, and P. C. Patton (eds.), *Flood geomorphology*. John Wiley & Sons, New York.
- [13] Dunne, T., and Dietrich, W., 1982. Sediment sources in tropical drainage basins. in S. A. El-Swaify and William Moldenhaur (eds.), *Soil erosion and conservation in the tropics*. Soil Science Society of America, Madison, Wisconsin. 41–75
- [14] Nayak J K and Hazra R. (1992) Development of design guidelines by laws. Thomas A F (ed).
- [15] Opra, K (2011). "Sustainable Architecture and Simulation Modelling", Dublin Institute of Technology

APPENDICES

TYPICAL NATURE OF THE ROAD NETWORK BEFORE CONSTRUCTION



A

B

Source: Researchers' Field Work, 2017

NATURE OF THE ROAD NETWORK AFTER CONSTRUCTION



A

B



C

Source: Researchers' Field Work, 2017

ON-GOING ROAD NETWORK



A



B



C



D

Source: Researchers' Field Work, 2017

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