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ASSESMENT OF SUSTAINABILITY APPROACH IN THE DISTRIBUTION OF HEALTH CARE FACILITIES IN OTUKPO LOCAL GOVERNMENT AREA, BENUE STATE, NIGERIA.

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ABSTRACT

This study assessed sustainability approach in distribution of health care facilities in Otukpo Local Government Area, Benue State, Nigeria. Its objectives were to analyse the distribution pattern of health care facilities in Otukpo LGA and identify communities that have 'shortfall' or 'surplus'; determine whether environmental features were considered before implementing the health care facilities and to evaluate environmental monitoring of health care facilities in Otukpo LGA. The study used mapping, questionnaire survey and observation in its methodology to collect data which were sourced from both primary and secondary sources. Data collected were analysed using statistical tools such as Nearest Neighbour Analysis, Location Quotients and Z-Scores. The results were presented in tables and figures. The result of Nearest Neighbour Analysis was 0.93 which mean that distribution pattern of health care facilities in Otukpo Local Government Area, Benue State is a cluster pattern. Location Quotients for health care facilities in all the communities ranged from 0 to 2.47. Location quotients for most of the communities are

less than one (< 1). This imply that majority of the communities has 'shortfall' of health care facilities. Only Otukpo has Location Quotients more than one (>1). Results also showed poor environmental considerations in siting health care facilities. It shows firstly that none (0%) of the respondents who are owners of health care facilities carried out environmental impact assessment of their infrastructure. Secondly environmental features such as geology/soil, relief, vegetation, temperature, rainfall and wind were largely neglected in the planning and implementation of health care facilities and that artisans, architects and land surveyor are the most(100%) professionals involved in health care facilities construction while geotechnical and structural engineers are not (0%) involved. There is also poor monitoring of the environment impacts health care facilities in the study area as it was shown that only twelve (12) respondents representing 20.7% of the respondents monitor the impact of their facilities on the environment. It was concluded that health care facilities distributions in Otukpo have lapses, such as inadequacy, lack of environmental integration approach and thus are unsustainable.

1. Introduction

Rapid and often unplanned population growth is often associated with population demands that outstrip infrastructure and service capacity and leading to unsustainable development. The provision of adequate and equitable basic health services is becoming increasingly difficult due to rapid population growth, rising poverty levels and lack of available resources. One of the imperatives of health care provision is a concern for both demographic and spatial justice. Accessibility to healthcare facilities has generally been identified as a major indicator of development, and the existing spatial pattern of distribution of healthcare facilities play very prominent role in determining the level of efficiency within any region. "Accessibility of health care facilities is one of the basic necessities of any modern human community. It is a major

complement to a strong, dynamic and progressive society"**(**Negngak and Makanjuola, 2011; Ayuba and Peter, 2016). Health is generally held at high esteem as we usually say that health is wealth and that a healthy nation is a wealthy nation. However, despite this value accords to health and early recognition of population influence on healthcare. Healthcare facilities in many countries of the world especially low income countries often do not keep pace with population growth. Thus, the achievement of the goal of health is one of the basic problems facing the third world countries and this is as a result of inadequate planning and rapid population growth, other factors include corruption, inequality, lack of political will and inadequate resources (Barton and Tsourou 2000; Basu and Friedman, 2001; Bala, 2017).

Health facilities form an important and integral part of life of any community, either rural or urban but they are unequally distributed over space. Many empirical findings have shown that facilities are unequally distributed in our communities such that the vast majority of the people are caught in a never ending struggle to gain access to these facilities in order to improve their quality of life (Fusheini and Eyles, 1996; Doherty, *et al.*, 1996; Basu and Friedman 2001; Oyerinde, 2006; Islam and Aktar, 2011; USAID, 2013).

According to Alabi (2011) spatial planning of healthcare facilities in an urbanizing area in addition to space should consider sustainability factors in the identification of suitable locations for a given number of health care facilities in a defined territory, in such a way that the needs of a dense population are served in an optimal and sustainable way. Thus, this study aimed to assess sustainability approach in the distribution of health care facilities in Otukpo Local Government Area, Benue State, Nigeria.

2. Methodology

The study used mapping, questionnaire survey and observation in its methodology to collect data which were sourced from both primary and secondary sources. Data collected were analysed using statistical tools such as Nearest Neighbour Analysis, Location Quotients and Z- Scores. Technique that were employed in this study include Otukpo Local Government Area base map, telephone that has Geographic Positioning System (GPS) software, phone camera, writing materials. Using these techniques and methods (questionnaire, observation and mapping), dada collection proceeded as follows:

Firstly, a base map was produced using Global Coordinate System (GCS84) and subsequently by geo-referencing, map of health care facilities was produced. Point locations of health care facilities were collected from the produced map. This included number of points, distance between each nearest points after which the mean distance were calculated to achieve the first and second objectives which are to analyze the distribution of health care facilities in Otukpo LGA and identify wards that have dense and those that have sparse facilities. Secondly, questionnaire and observation were used to collect data on the integration of environment in health care facilities in Otukpo LGA.

2. Results and Discussion

The Pattern of Distribution of Health Care Facilities in Otukpo LGA

The distribution of health care facilities in Otukpo local Government of Benue State is presented in figure 1.

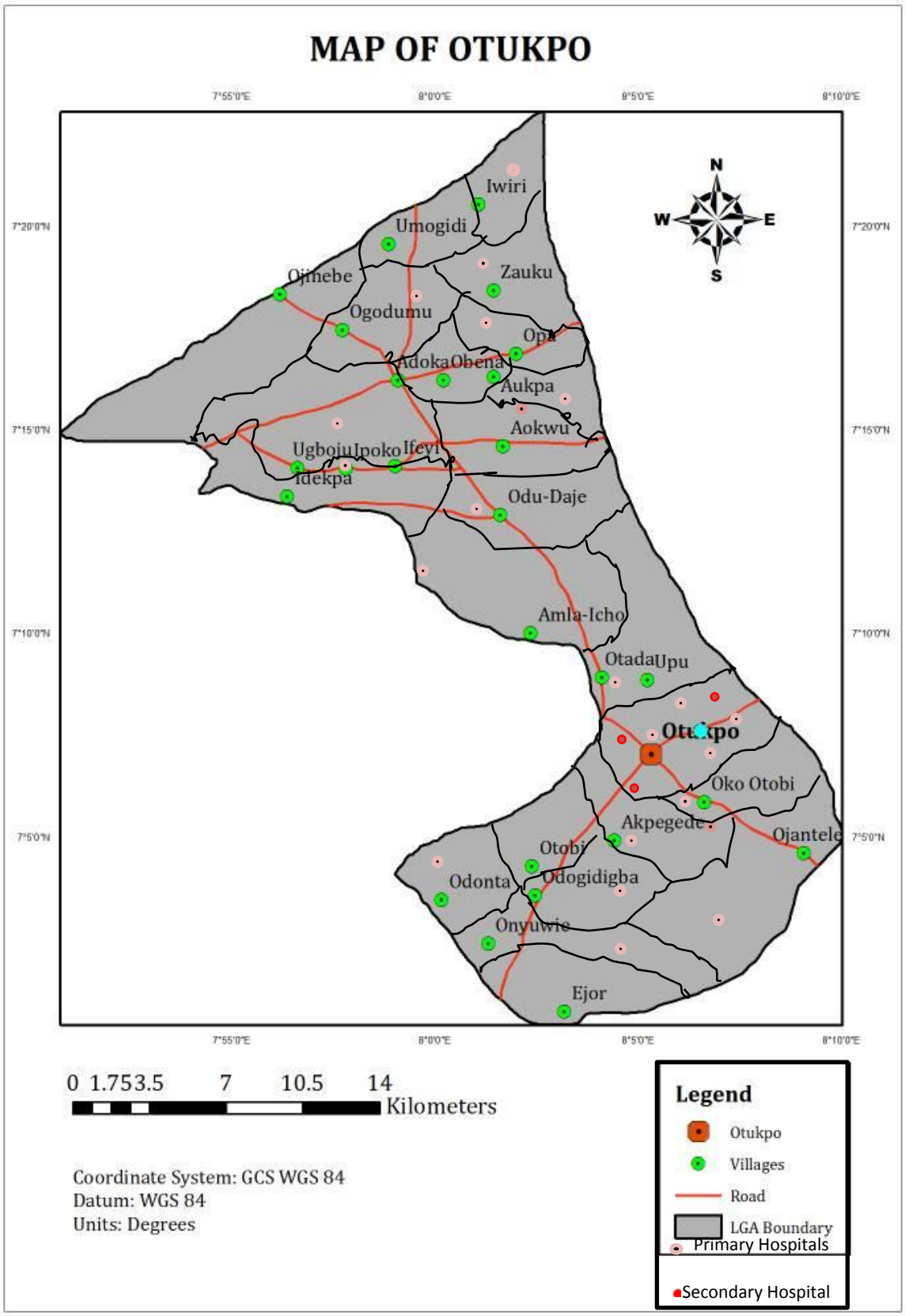

Figure 4.6: Distribution of Health Care Facilities

Source: Coordinate System (GCS WGS 88)

Table 1 present the frequency distribution of health care facilities among the twenty-four communities in Otukpo Local Government Area, Benue State.

Table 4.1: Frequency Distribution of healthcare care facilities in Otukpo LGA

Communities	No of healthcare facilities
Iwiri	1
Umogidi	0
Zauku	
Oginebe	0
Ogodumu	1
Opa	1
Adokaobena	0
Aukpa	1
Aokwu	1
Obojuipoko Ifeyi	1
Idekpa	1
Odu-Daje	1
Amla-Icho	1
OtadaUpu	1
Otukpo	7
Oko-Otobi	1
Otobi	0
Akpegede	2
Ojantele	1

Odogidigba	0
Odonta	1
Onyuwie	1
Ejor	0
Total	22
Average	2.83

Using nearest neighbour analysis, the pattern of distribution of in health care facilities Otukpo Local Government of Benue State was determined as follows:

$$Rn = 0.5 \text{ X } \frac{\overline{D}}{\frac{1}{\sqrt{N/A}}}$$

Where Rn = value of the nearest neighbour statistic, $\overline{D}$ = mean distance between nearest neighbours, A = total area under study and N = number of points in the map.

$D = 2.3$

$N = 22$

$A = (5 \times 6.5)\ 32.5cm^2$

Therefore

$$Rn = 0.5 \text{ X } \frac{2.3}{\frac{1}{\sqrt{22}/32.5}}$$

$= 0.93$

The result of Nearest Neighbour Analysis for health care facilities is 0.93; this shows that the distribution pattern of health care facilities in Otukpo Local Government Area, Benue State is a

cluster pattern (Figure4.1). Thus, Ho "There is no significant difference between the distributions health care facilities and a random pattern is rejected. Therefore, the distributions of health care facilities in Benue State concentrate in particular area and are not evenly distributed. Thus, some communities have higher concentration than others. The distribution pattern of health care facilities in Otukpa is not different from most of earlier studies in other regions. Average nearest neighbor as a spatial statistical tool has been used to identify cluster, dispread, and random distribution of health facilities over space (Alabi, 2011; Umar and Bolanle, 2015; Shawky, 2016). The implication of cluster pattern of health care facilities is that the areas that lack the facilities find it difficult to access health services owing to long distance to area of concentration.

Having seen a clustering pattern in location of health care facilities, Location Quotients (L.Q) was used to determine area that has 'shortfall' or have 'Surplus' health care facilities (Table 2).

Table 2 Location Quotients for Health Care Facilities in Each Community

Communities	Location Quotients Health care facilities
Iwiri	0.35
Umogidi	0
Zauku	0.35
Oginebe	0
Ogodumu	0.35
Opa	0.35

Adokaobena	0
Aukpa	0.35
Aokwu	0.35
Obojuipoko Ifeyi	0.35
Idekpa	0.35
Odu-Daje	0.35
Amla-Icho	0.35
OtadaUpu	0.35
Otukpo	2.47
Oko-Otobi	0.35
Otobi	0
Akpegede	0.35
Ojantele	0.35
Odogidigba	0
Odonta	0.35
Onyuwie	
Ejor	0

Decision

Location Quotients in all the communities ranged from 0 to 2.47. The Location Quotients for most of the communities are less than one (< 1). This imply that majority of the communities has 'shortfall' of health care facilities. In short only Otukpo has Location Quotients more than one (>1) as shown in figure1 and Table 2. This corresponds with the clustering pattern of found using nearest neighbour analysis.

Effort was made during the survey to investigate the functionality of these health care facilities, it was found that most of the healthcare facilities are not functional and are in dilapidated conditions (Plate 1 -3 2).

Plate1: Non Functional Primary Health care in Idekpa, Otukpo LGA

Plate 2: Dilapidated health care center in Aukpa Otukpo LGA

Plate 3: Poor state of Health care facility in Akpegede, Otukpo LGA

Consideration of Environmental Features before Implementation of Health Care Facilities in Otukpo LGA.

Using some indices such as professional involvement, environmental features (geology, soil, relief, vegetation, temperature, rainfall and wind). Questions were raised to assess the environmental considerations in siting health care facilities and distributed to owners and managers of health care facilities. Table 3 present the response for environmental considerations in siting health care facilities.

Table 3: Response for Environmental Considerations in Siting Health Care Facilities.

Question	Options	Affirmation of option (N = 58)	Percentage
Carried EIA	Yes	0	0
	No	58	100

Professional involved in Building social Infrastructure	Builder	8	13
	Geotechnical engineer	0	0
	Architect	58	100
	Land Surveyor	50	86
	Structural Engineer	0	0
	Building Service Engineers (Mechanical and Electrical Engineers)	23	40
	Artisans(masons, carpenters, electricians, iron fixers, tillers, and plumbers)	58	100
	Quantity Surveyor	4	6.9
Environmental features considered before sitting infrastructure	Geology/soil	15	25.9
	Temperature	0	0
	Wind direction/speed	0	0

	Vegetation	0	0
	Relief	29	50
Baseline data collected before construction	Soil	0	0
	Flora and fauna	0	0
	Temperature	0	0
	Population	45	77.6
	Existing structures	52	89.7

Table 3 shows poor environmental considerations in siting health care facilities base on respondents' affirmation of options. It shows firstly that none of the respondents who are owners of health care facilities carried out environmental impact assessment of their infrastructure. Secondly environmental features such as geology/soil, relief, vegetation, temperature, rainfall and wind were largely neglected in the planning and implementation of health care facilities. Most the health care facilities owners only considered the population and existing structures in sitting their facilities. Thirdly, there is poor involvement of professionals in facilities construction (Figure 2).

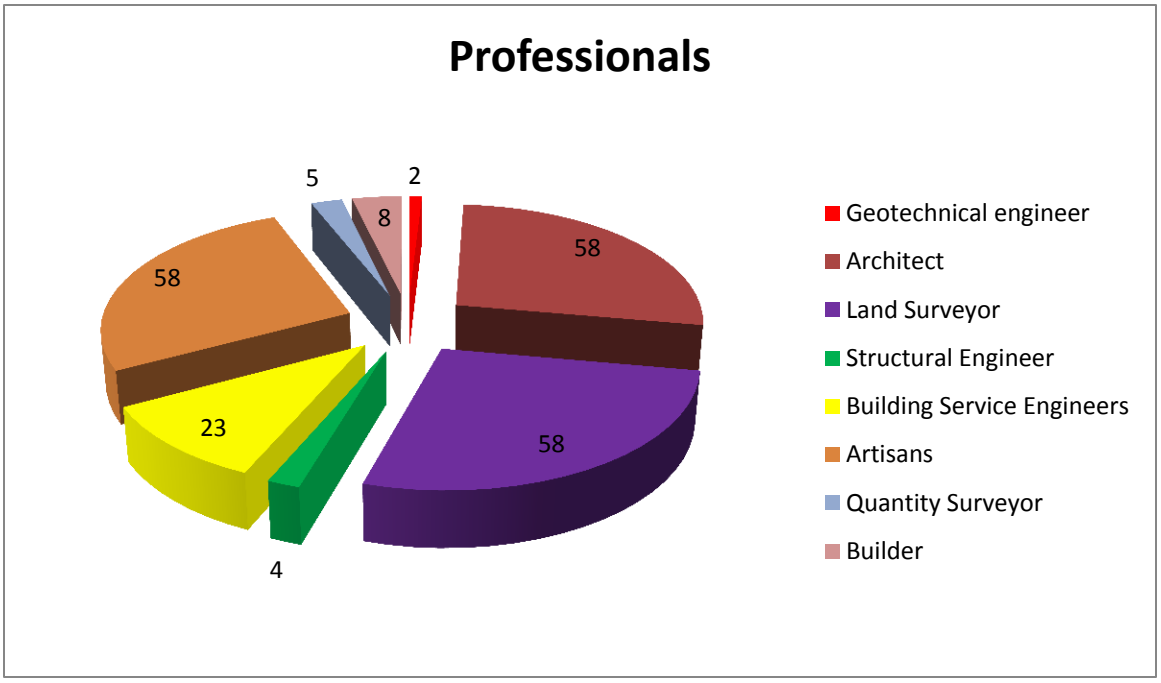

Figure 2: Affirmation of Professional involvement in Construction of Facilities.

Figure 2 shows that artisans, architects and land surveyor are the most (100%) professionals involved in construction of health care facilities in Otupko LGA while geotechnical and structural engineers are not (0%) involved. According to an article by Fame pyramids in 2013 "the building construction industry is a wide industry that encompasses many professionals. Most of the building defects like cracks on walls, inadequate and non-functional facilities, flooding and dampness, poor drainage, poor safety design, poor staircases and even collapse to mention a few could be avoided". Thus, the poor involvement of professional such as geotechnical and structural engineers contributed to poor conditions of health care facilities and environmental degradation witnessed around health care facilities in Otukpo Local Government, Benue State (Plate 4 & 5).

Plate 4: Poor Conditions of Health Care Facilities and Environmental Degradation in Otukpo, Otukpo LGA

Plate 5: Degraded Health Care Facility in Ejor, Otukpo LGA

Plate 4 and 5 Portray environmental degradation and poor condition of health care facilities.

Plate 5 for example shows poor condition of foundation of private health care facilities, this is largely due to poor professional involvement in construction of the infrastructure.

Integration of Green Infrastructure in Health Care Facilities in Otukpo LGA

To assess the integration of green infrastructure in health care facilities in Otukpo LGA, inclusion of a network of open space, airsheds, stormwater system and green energy are indices used (Table 4).

Table 4: Affirmation of Green Infrastructure Inclusion in Health Care Facilities in Otukpo LGA

Parameters	Affirmation	Percentage (%)
Open Space	48	83
Airsheds	40	69
Stormwater system	8	13
Green Energy	10	17

Table 4 shows that majority (83%) have open space, sixty-nine per cent (69%) have aresheds but only thirteen (13) and seventeen (17) per cent have stormwater system and make use of green energy respectively.

Z-scores were used to compare the affirmation of the inclusion of green infrastructure.

The Z-scores are a way to compare results from an observation to a “normal” population.

Z-scores is donated by z and formula $z = (x - \mu) / \sigma$ (Table 5)

Table 5: Z-Scores for the Affirmation of the Inclusion of Green Infrastructure

Parameters	Affirmation (X)	X-X	$X-X^2$	Z- Score($z = (x - \mu) / \sigma$)
Open Space	48	21.5	462.25	1.21
Airsheds	40	13.5	182.25	0.76
Stormwater	8	-18.5	342.25	- 0.02
Green Energy	10	-16.5	272.25	- 0.93
Mean	26.5			
Total	132.5		1259	

Table 5 shows that open space and airshed were affirmed above average while stormwater and green energy were affirmed below average. These indicate that both air space and airsheds are well included in health care facilities unlike stormwater and green energy. This might be connected to the fact that Otokpo Local Government Area is still more rural in nature given room to enough space (Plate 6). Contrary, stormwater system and green energy are not well utilized probably due to low technology know how and brain drain of rural areas. However, Hellmund *et al.,* (2006) advised that "green infrastructures are better planned and inculcated before development begins. Land can be designated appropriately for protection and/or restoration to provide wildlife habitat, recreation, stormwater treatment, energy savings, aesthetic values, improved community health, and sustainable economies". Thus, infrastructure developers are encouraged to employ green energy and stormwater system in new building sites.

Environmental Monitoring of Social Infrastructures in Otukpo LGA

Respondents were asked questions on environmental monitoring of their social infrastructures using parameter such as soil (erosion and flood), waste generation and management, (Table 6).

Table 6: Respondents' Affirmation on Environmental Monitoring of their Facilities

Questions	Options	Affirmation	Percentage (%)
Do you monitor the impact of the structure on the environment?	Yes	12	20.7
	No	46	79.3
If yes above, what do you monitor?			
Erosion	Yes	10	17.2
	No	48	82.7
Flood	Yes	12	20.7
	No	46	79.3
Waste	Yes	8	13.7
	No	50	86.2
If yes above, how often?	Monthly	0	0
	Quarterly	0	0
	Twice yearly	3	25
	Annually	9	75
If no above, why?	Time factor	12	20.7
	Financial factors	14	24.1
	Negligence	30	51.7

Table 6 portray poor monitoring of health care facilities impact on the environment in the study area as it shows that only twelve (12) respondents representing 20.7% of the respondents monitor the impacts (erosion, flood and waste) of their structure on the environment (Figure 3).

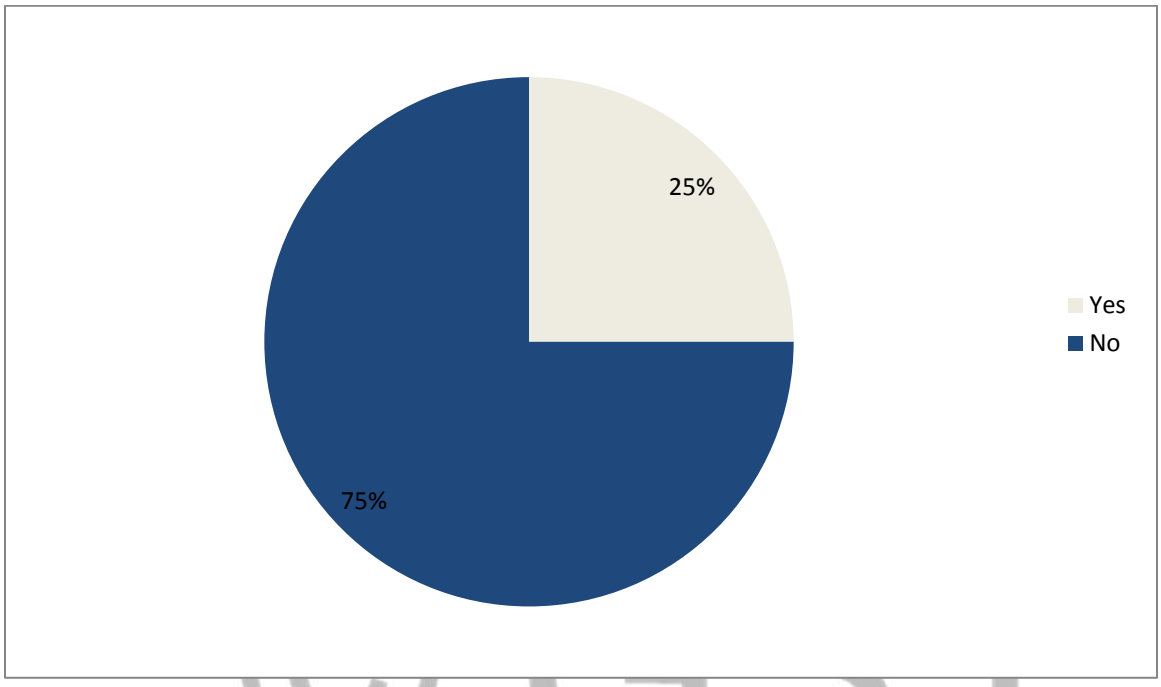

Figure 3: Percentage of Respondent that Monitors their Social Infrastructure Impact on the Environment

The monitoring interval for those that monitor was also high as majority seventy-five per cent (75%) monitor annually, twenty-five (25%) monitor twice in a year (biannual) and none monitor

monthly and quarterly (Figure 4).

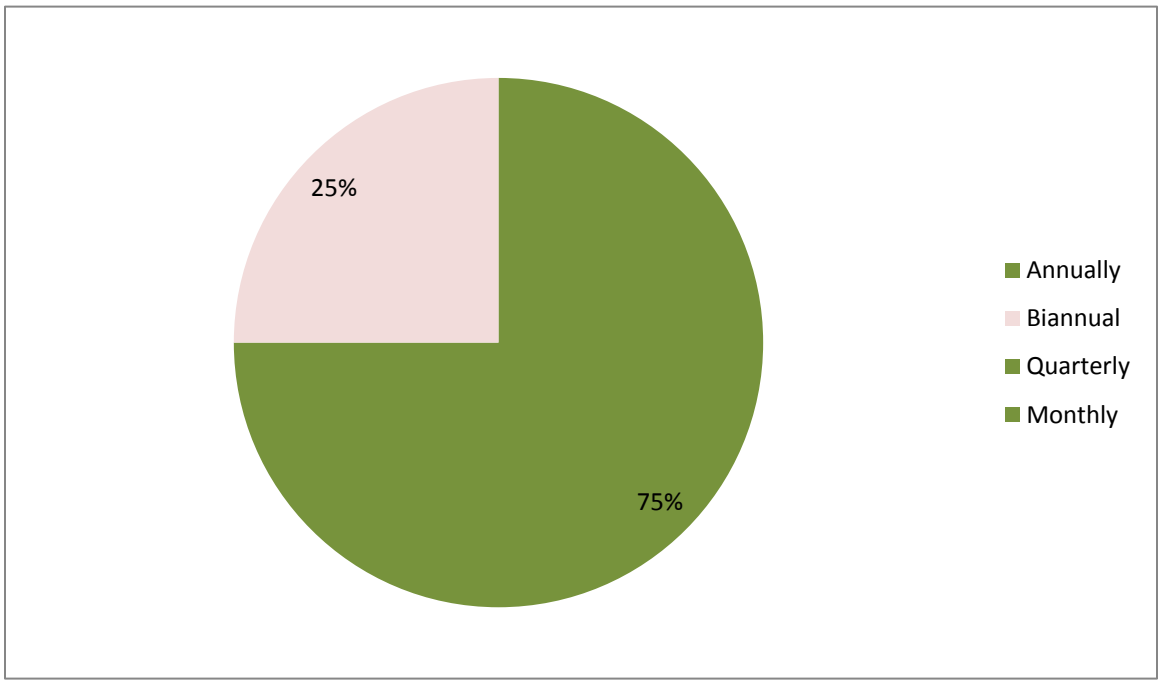

Figure 4: Monitoring Interval for Those That Monitor

Interaction with the respondents shows that most of them that do monitor, only do that during rainy season by simply observing environmental challenges such as wind storm, flood and erosion in order to react to this effects not necessarily to prevent this occurrences. On the reasons for not monitoring, majority (51.7%) are just for negligence, 21.7 and 24.1% affirmed time and financial factors respectively (Figure 5).

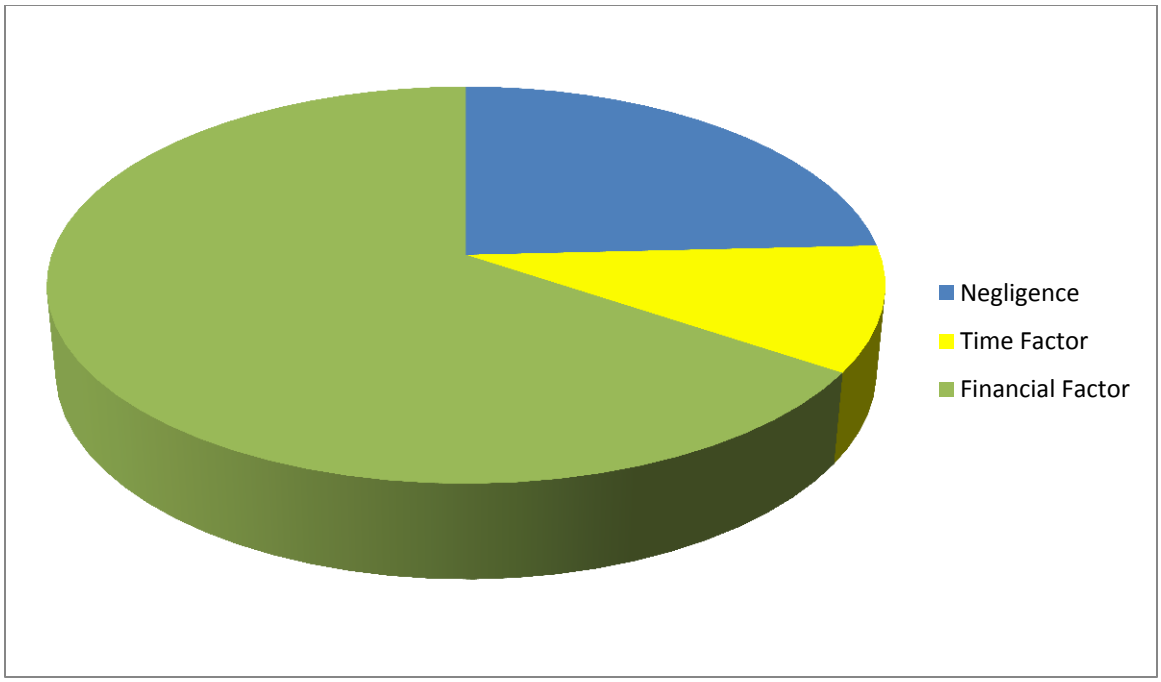

Figure 5: Reasons for not Monitoring Environmental Impact of Social Infrastructure

Though, the sizes of social infrastructure surveyed in Otukpo do not need detail EIA, monitoring of the impacts of an infrastructure project during its operation and maintenance should be an ongoing and regular process to accommodate variations in its function, new standards or best practice, improved knowledge, changing impacts, such as those associated with climate change. Thus, the infrastructure owner or operator needs to monitor and assess routinely the performance of the infrastructure. The key structures and tools for this continual monitoring process should be identified and implemented during the design phase and be used to review options as the infrastructure ages. The poor involvement of professionals and negligence for monitoring are major threat to sustainable health care facilities in the study area.

3. Conclusion

To sustainability should be keyed into any form of development, both distribution and architectural designs health care facilities should embrace sustainability approach because

negligence for environmental sustainability in both distribution and architectural designs of social infrastructure poses severe impairment for sustainable urban development.

Data from the survey show that distribution of health care facilities in Otukpo LGA is not even. It is a cluster pattern. Most communities in Otukpo Local Government Area has 'shortfall' of health care facilities, there is poor environmental sustainability considerations in siting health care facilities and poor monitoring of infrastructure impact on the environment in the study area.

Therefore, health care facilities distributions in Otukpo did embrace sustainability approaches and thus are unsustainable.

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