

Spatial Distribution Of Telecommunication Masks And Its Adherence To Environmental Standards And Guidelines

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DOI: 10.29322/IJSRP.10.06.2020.p10251

<http://dx.doi.org/10.29322/IJSRP.10.06.2020.p10251>

Abstract: *This research work was aimed to analyze the spatial distribution of telecommunication masks and its adherence to environmental standards and guidelines in mubi metropolis using geographic information system (gis). in nigeria, the fast rise in the use of mobile telecommunication in recent years has resulted to a rise in the amount of mobile transmission masts being built near resident's areas and the mobile telecommunication industry has a tremendous impact on the socio – economic growth of Adamawa state and nigeria at large. the objectives are to; identify and map out all the telecommunication mast located in the study area, examine whether service providers observe all the necessary environmental standards and guidelines before location of telecommunication masts, examine the socio – economic impacts of mobile telecommunication masts on mubi town and examine the environmental effect of telecommunication masts location experienced by resident in the study area. coordinates of all the telecommunication masts in mubi environment was collected and digitized using arcgis to create a visual map of point and polygon features classes indicating the mobile telecommunication masts. buffer analysis was also carried to determine one of the whether some of the mobile telecommunication met with the environmental standards and guidelines by ncc in locating mobile telecommunication masts. the study revealed that 23 masts accounting for 74.2% of the mobile telecommunication masts violated environmental standards and guidelines. lastly, the study also revealed that the mobile telecommunication masts has effect on the environment thereby causing environmental pollution to its environs (i.e. emission of carbon monoxide). based on these findings the study recommends that; the federal, state and local government should ensure to create enlightenment/awareness campaign to the public regarding the health hazards/illness of residing near a mobile telecommunication mast. the ncc should follow the global trend on recent findings about health implications of sitting base stations around residential neighborhood and ensures that international safety standard is strictly adhered to by mobile telecommunication operators in the study area.*

Keywords: *Telecommunication, Database, NCC, Spatial Distribution, NESREA*

INTRODUCTION

Telecommunications has been described as a technology for remote communication. Telecommunication masks tower consist of a body framework made of steel beams and materials with a concrete foundation approximately 25 to 55 meters in height. The antennae, transmitter and receiver are installed on the body of the structure. These antennas obtain high-frequency radio waves from cell phones. The range of these antennas ranges from radius as short as 1.5 to 2.4 km to distances as long as 48 to 56 km. Other accessories are given to the energy source, all fenced either by block wall or steel poles and wire, depending on the service provider. The region covered by each mask is overlap 144m² (Ike, Adoghe, and Abdulkareem, 2014).

In the telecommunication world, GIS is used for network planning and development. The ability to layer information onto the earth's surface, complete with attribute data, allows engineers the unique ability to model and assess a network from the office. This saves valuable time and reduces the number of trips (Wang 2010). Furthermore, the powerful automation capabilities offered by a GIS increase the speed and accuracy of the network design process and can help reduce, and even eliminate, the downstream impacts of

design-phase errors on cost and schedule during the network deployment phase. The skill level and design time involved in hand-producing comparable designs would be significantly higher.

In Nigeria, the fast rise in the use of GSM in recent years has resulted to a rise in the amount of mobile transmission masks being built in or near residential areas. According to the Nigeria Communication Commission (NCC), the technical specification for the installation of telecommunications masks and towers dated 9 April 2009 and issued on 9 April 2009 shall be reduced by a minimum of 50 meters from the right-of-way of all controlled access to federal and state roads / highways designated as freeways in order to provide unobstructed flight. The range for setback shall also be 5 meters from any estate other than the fence (NCC, 2016). There have been conflicts between the NCC and the National Environmental Standard and Regulatory Enforcement Agency (NESREA) over the regulation of telecommunications masks. Both organizations have contradictory set-aside laws that should be observed by telecommunications providers at the place of their base stations.

Most of the base stations are situated in close proximity to the landed estates in the metropolis owing to the existence of business operations and those situated away from the residential buildings have been invaded by residence owing to demand for property and an increase in population, among other factors. The inconclusive stance on the connection between the place of mobile telecommunications masks on the environmental and socio-economic impact neighboring resident informs this study in the Mubi town.

The 2016 Standards for Base Station by Nigeria Communication Commission in Collaboration with National Environmental Standard Regulatory Enforcement Agency (NESREA).

The maximum height that may be approved for telecommunication tower in Nigeria is 150m. A tower more than 50m in height may be approved by Nigeria Communication Commission (NCC) if the commission is satisfied that the increase height of tower: Will not be detrimental to the public health, safety, will not have a substantial negative effect upon neighborhood as well as conformity with the intent and purpose of the planning of the area and the general plan of the community and will not impair the obligation to comply with any other applicable laws or regulations.

Structure: All telecommunications towers as well as guys and guy anchored shall be Located within the buildable area of the property. Telecommunications towers in excess of 150m. in height shall be set back a minimum of 50m from the right of way of all controlled access, federal and state road ways designated as freeways, towers shall be set the greater distance of 10m from any residential or used property.

Tower to Tower Spacing: Tower in excess of 55m in height must be located at a minimum of 1km from any other existing tower in excess of 55m in height.

World Health Organization (WHO) Criteria

According to World Health Organization (WHO) (2007) regulations for locating a GSM Base Station in Nigeria: that Mask should be erected 10m from the perimeter wall (fence) of residential, where there is no perimeter wall (fence), a Based Station must be at a minimum of twelve (12) meters and above from the wall of residential, educational, hospital, child care centers and nursing homes. The organization also ascertained that Mask should not be erected on Agricultural lands because of its effect on the crops. These criteria should be met for a GSM Base Stations to assume spatially sound located.

Alternatively, a key to the sensitive locating, sitting and design of telecommunications equipment is an understanding of the area landscape. The best opportunities for the sitting of masks are: Railway land, Recycling Areas, Waste water treatment works, Industrial/General Business Areas, and so on. (Wang, 2007).

Telecommunication Masks and Environmental Effects

Significant concerns have been raised about the possible impacts of exposure to electromagnetic waves which is being emitted by the telecommunication masks, in particular following the fast implementation of mobile telecommunications technologies. People living around the base of the mobile telecommunications mask are generally more concerned about the potential risks associated with living close to them (Wolf and Wolf, 2016). Several empirical studies have been carried out with regard to its impact and some of these are examined the effects on exposure by animals and humans.

Magras and Xenos (2014) looked at effect of exposure by animals in which they recorded a progressive decrease in the amount of rodent births subjected to radiofrequency. After five generations, snakes subjected to $0.168\mu\text{W}/\text{Cm}^2$ became sterile, while those subjected to $1.053\mu\text{W} / \text{Cm}^2$ became sterile after only three generations. In the town of Casavieja (Avila, Spain). The problem became so bad that the town council decided to disassemble the antenna. It was withdrawn in the spring of 2005 and pig miscarriage has since stopped (Alfonso, 2009). In pregnant mice subjected to 27.12MHz constant waves at $100\text{W} / \text{Cm}^2$ during separate pregnancy phases, half of pregnancies miscarried prior to the twentieth day of gestation compared to only 6 per cent miscarriage at non-exposed controls and 38% of feasible fetuses had incomplete cranial ossification compared to less than 6 per cent of controls (Pearsson, 2010).

The Effect of Exposure by Human: Several medical reports have related radiation diseases emitted by telecommunications masks. This revealed a case-by-case medical report to Mr. Afolabi Oyekanmi (who has a mask in his home) at the Ado Ekiti University Teaching Hospital. It was evident that the location of a telecommunications mask too close to his home is harmful and dangerous to his medical condition, if not the cause. The person was taken to the hospital accident and emergency unit in January 2011 with a convulsion-related loss of consciousness complaint. The doctor concluded that he was not a renowned epileptic, diabetic, hypertensive or asthmatic patient, In the same way, the physicians at the University College Hospital, Ibadan, related the emission of electromagnetic impulses from masks situated near the homes of the Adebusola Ogundipe family of Ibadan to their ills. The health of the entire family was said to be in risk. The matriarch of the family has a feeling of pain and tingling on her legs and has also been diagnosed with leukaemia. Her kids endured loss of memory, dizziness and blood from their noses. It was clear that these conditions were not coincidental; they were the consequence of certain environmental variables (Ogboru, 2015). Despite these allegations, there is widespread science, epidemiological and medical proof that confirms that exposure to radiofrequency emitted from cell towers, even at small concentrations, may have adverse effects on biological structures (Cherry, 2012). In a research conducted at the Berlin Institute of Research, it was found that during the first 3-5 years of exposure, individuals suffer from sleep disorders, a decrease in melatonin leading to immune deficiencies. From 5-7 years on, neurological issues become apparent with headaches, confusion and memory loss. After 10 years, severe illnesses such as cancer have occurred and health harm has become irreversible.

Likewise, the University of Washington study says that one must consider the impact of long-term exposure when considering the impact of radiation from wireless transmitters. Although the amount is small, it would be important if the impacts of radiofrequency radiation were to be cumulative. Small doses that accumulate over a lengthy period of time will eventually lead to damaging impacts. Children are said to be at biggest danger due to their unique vulnerability during pre-birth and post-birth developmental phases. More than 100 physicians and researchers at Harvard and Boston University Schools of Public Health have identified radiation hazards in cell towers, while 33 delegates from seven nations have declared cell phone towers "a public health emergency" (Kauppi, 2010).

Cell phone towers expose the public to unintentional, chronic cumulative radiofrequency radiation. Harmful small concentrations of radiation can reach as far as a mile away from the place of the cell tower. A research involving approximately 1,000 patients in Naila,

Germany, found that the percentage of freshly emerging cancer cases was considerably greater among those who lived at a distance of up to 10 years within 400 m of the cellular transmitter site relative to those who were living further away (Hart et al., 2012). Also, in Austria, the study shows that people whose homes are 100 m or less from the base station had a greater rating in psychological strain scales, a considerably greater concentration of alpha-amylase in their saliva, obsessive compulsiveness, anxiety and so on (Hutter, Moshammer, Wallner and Kundi 2009). In addition to the emission of radiation, there is also an issue with the heat from the transmitters, the smoke and the noise from the generators that power these installations. Heating impacts become meaningless when the range from the microwave transmitter exceeds a few meters (Elieen, 2010). As telecommunications masks are located in Nigeria, it is unsure how much of the heat population is suffering. Undoubtedly, smoke and noise are a familiar element for Nigerians.

Empirical work has also been carried out in Nigeria by scientists to demonstrate that mask sites have a comparative impact on inhabitants. Onifade, Jeliliand and Asani (2015) revealed in their research in Ibadan that the undisclosed location of masks in the Egbeda Local Government Area of Oyo State induced partial deafness, affected the reception of television / radio, and the diesel from the generator also polluted the subterranean water around the mask sites, which could lead to water-based illnesses. Akintonwa, Busari, Awodele and Olayemi (2009) studies conducted in Lagos have shown that closeness and length of mask radiation is directly proportional to the risk impact. From the study, the majority of respondents remained close to the mask in the range of 1-50 m, accounting for 31.5 per cent of respondents, 24 per cent in the range of 50-100 m and 18 per cent in the range of 100-1000 m, and the average power density in the range of 200 m was $1.32 \pm 0.075 \text{ mW / cm}^2$. Akintonwa et al 2009, stated that most of the participants had distinct symptoms, with headache being the most frequent symptoms comparable to other proven results. The writers also demonstrated that there is an important connection between high voltage cables and the telecommunications mask to the health impact of the participants.

Statement of the Problem

The establishment of more telecommunications infrastructure, such as the GSM base station, has raised some environmental concerns. It has become part of the setting to see tall masks in various places around the nation. These masks, although useful, are thought to have adverse impacts on individuals residing close them (Ayinmoda, 2015). The fast development in mobile phone use in latest years has been followed by government concern about the health and safety hazards associated with microwave radiation and the negative visual amenities of telecommunications masks (Santini, *et al.*, 2013). To this end this research will look add the major environmental standard and the adherence by the mask as will as the spatial distribution

The Study Area

Location and Extent

The study area lies between latitudes $10^{\circ} 15' 0''$ and $10^{\circ} 30' 0''$ North of the equator and between longitudes $13^{\circ} 15' 0''$ E and $13^{\circ} 30' 0''$ East of the Greenwich Meridian. Mubi town is the metropolitan headquarters of Mubi North and South Local Government Areas of Adamawa State. This local government were created on the 7th February 1996; the study area shares common boundary with Hong Local Government Area to the west, Michika to the North, and with Cameroon Republic in the East (Figure 1).

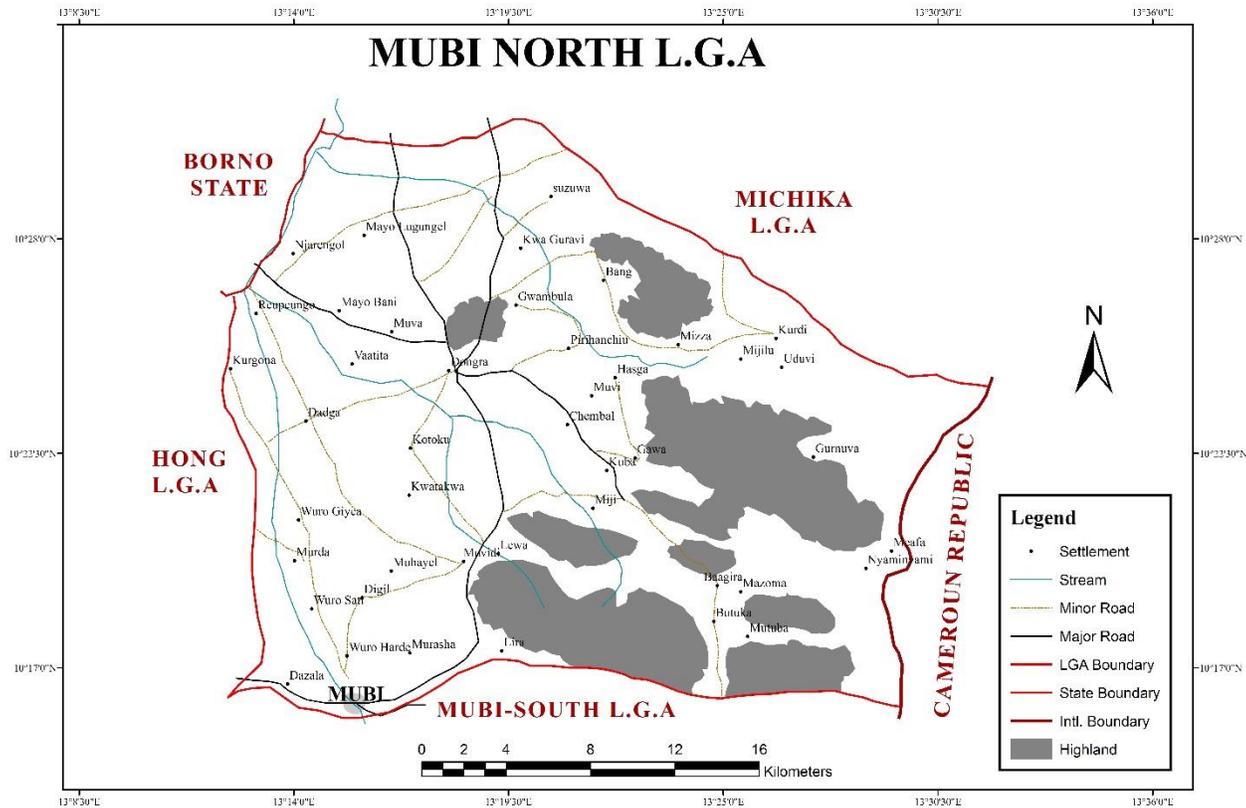


Figure 1: Study Area

Source: Dept. Geography ADSU

METHODOLOGY

Data Types and Sources

This research employed both the primary and secondary types of data. The primary source of data was involved the use of GPS coordinate of the telecommuting mask and the secondary type of data includes the literatures which was collected from the previous scholarly works and these includes related journals/publications, articles, textbooks, newspapers, thesis/dissertation and conference papers.

Method of Data Analysis

The various data obtained for the study were analyzed using some relevant statistical techniques such as descriptive statistics which include tables and simple percentages which were used to identify and map out all telecommunication mask located in mubi metropolis. The database was imported into ArcGIS environment and the data containing the relevant vector Shape files were checked in ArcGIS environment to create a visual map of point and polygon features classes. The X and Y coordinate of the facilities has then automatically displayed the locations of all the base stations on the map. This shows the distribution of the facilities across the study location and in examining whether service providers observe all the necessary environmental standards and guidelines before location of telecommunication masks. To attain this objective the researcher, conduct a reconnaissance survey whereby all the telecommunication masks in the study area and correlate the situation with the national standard.

DISCUSSION AND RESULT

This section provides the discussion and results of all the data collected and analyzed from the area of study during this research period. Which in involve the GPS coordinate of the telecommunication masks

Identification and Mapping of Masks located in Mubi Metropolis

A database of the telecommunication masks was created and the data containing the relevant vector Shape files were imputed into ArcGIS environment to create a visual map of point and polygon features classes. The X and Y coordinate of the facilities has then automatically displayed the locations of all the base stations on the map (Figure 2 and 3) shows the distribution of the facilities across the study location as the locations of the telecommunications masks in Mubi metropolis. According to the locations of the mask on Figure 1, it is therefore depicted that majority of the mask are situated at commercial, residential areas and administrative center within the study area. This is based on the fact that marketing and trading have been dominant financial activities of the population of Mubi town.

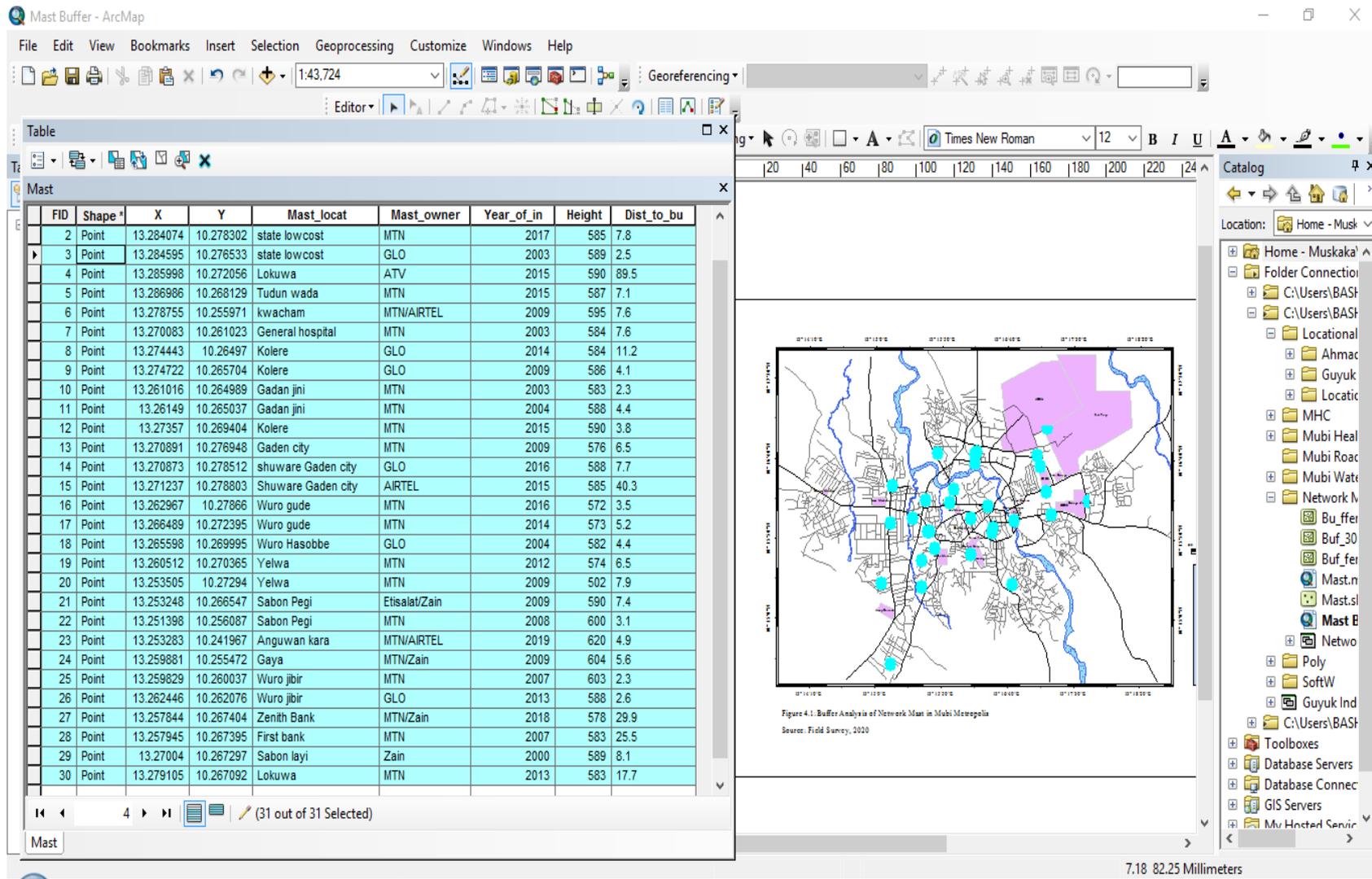


Figure 2: spatial

attributes of GSM mask in Mubi metropolis

Source: Researchers Work

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<http://dx.doi.org/10.29322/IJSRP.10.06.2020.p10251>

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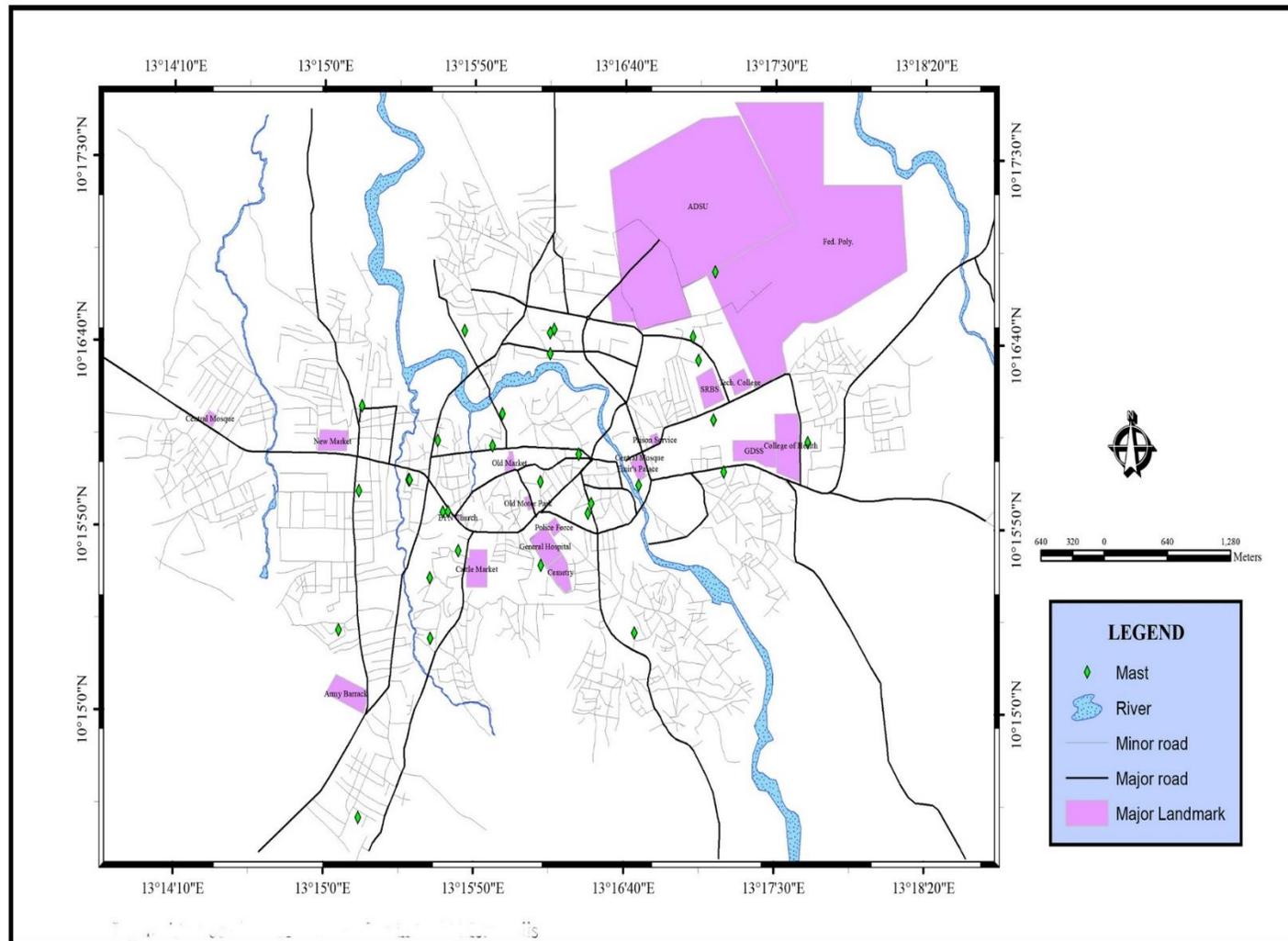


Figure 2: Location of Network Mast in Mubi Metropolis

Source: Field Survey, 2020

A buffer analysis was conducted in order to obtain the second objective of the study as shown Figure 3. According to the buffer analysis (proximity) module of ArcGIS carried out module of ArcGIS using the NESREA standard that residential building should not be less than 10meters to network mask, it was discovered that out of 31 mask in Mubi metropolis only 8 out of the 31 mask were located outside the buffer zone of 10 meter. This indicates that 23 mask accounting for 74.2% of the total violated the NESREA standard and this mobile telecommunication masks include: NTA (Barama), MTN (Lokuwa), MTN (First Bank), MTN/Zain (Zenith Bank), MTN (ATV), Federal Polytechnic (MTN), Kolere (Glo) and Shuware Garden City (Airtel) respectively as seen in Table 1.

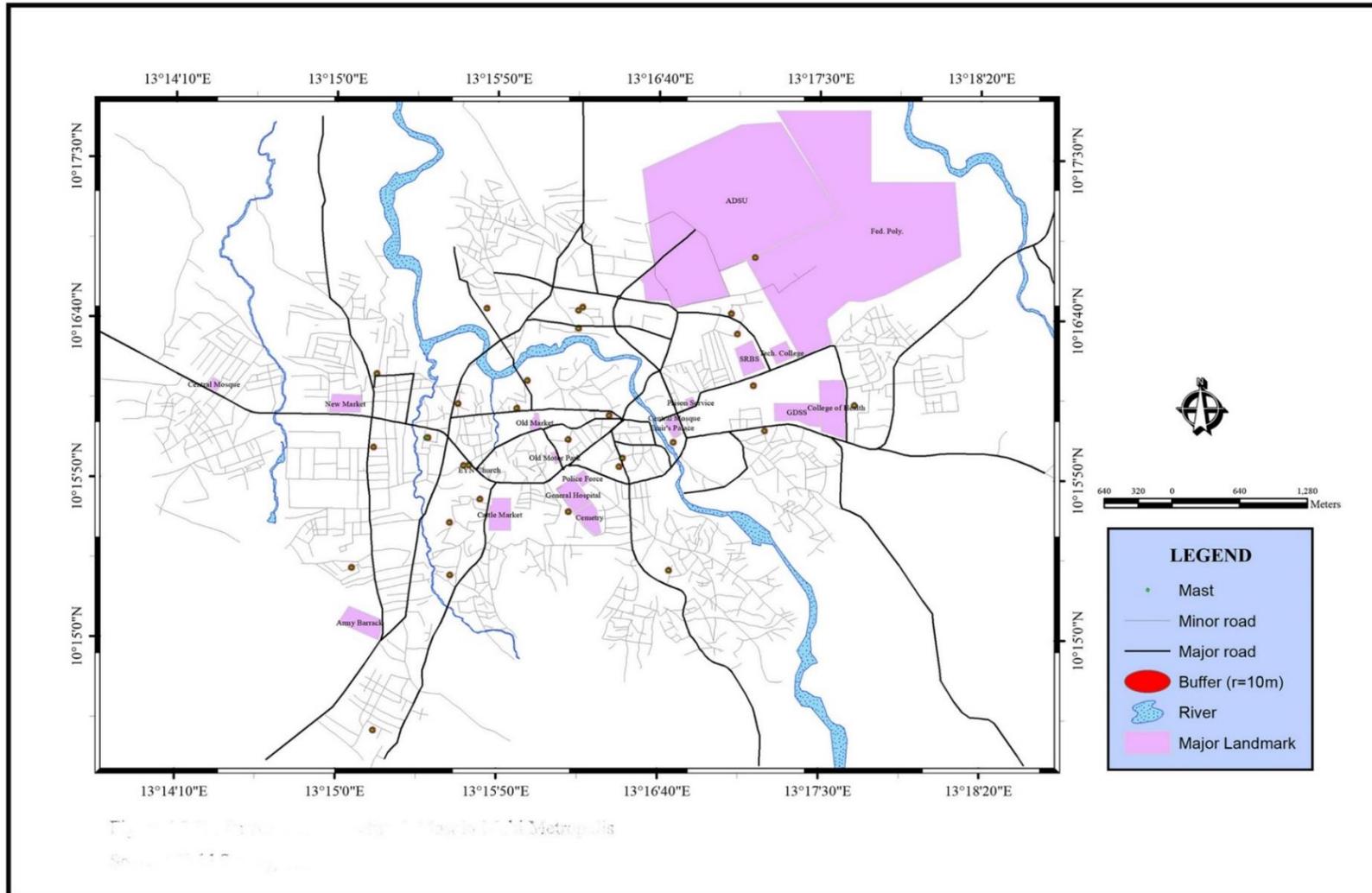


Figure 3: Buffer Analysis of Network Mask in Mubi Metropolis

Source: **Field Survey,** 2020

RECOMMENDATIONS AND CONCLUSION

Recommendations

Based on the findings of the research, the followings are the recommendations suggested:

1. The Federal, State and Local government should ensure to create enlightenment/awareness campaign be made to the public regarding the health hazards/illness of residing near a mobile telecommunication mask.
2. The National Environmental Standards and Regulation Enforcement Agency (NESREA) should rise up to their responsibility of ensuring a safe environment for residents living close to these masks and the populace at large.
3. The NCC should follow the global trend on recent findings about health implications of sitting base stations around residential neighborhood and ensures that international safety standard is strictly adhere to by mobile telecommunication operators in the study area.

Conclusion

This research reveals that Mobile telecommunication masks have posed negative effects on the environment and these negative effects includes the noise, vibration and fumes generated from the standby power generators cause pollution to the environment. The engine oil when changed from the generator also spilled out and pollutes that land around the environment.

The study also reveals that, Mobile telecommunication masks posed an effect on health of residents close to the masks and not only residents living close to the masks but residents around these masks. The mobile telecommunication masks release electromagnetic waves and this waves that is being released may causes short term memory, sleep disorder, increase in leukemia, partial deafening headache, risk of brain tumor and speed of cancerous growth amongst others as stated by many authors.

In conclusion, this study has analyzed the environmental and socio – economic impact of mobile telecommunication masks on Mubi residents, Adamawa State. The study had revealed positive impact of mobile telecommunication masks on the socio - economic activities of the people in the study area. It has revealed that there is great environmental of this mobile telecommunication masks both on the environment and health/illness of the residents living around these mobile telecommunication masks.

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