

## Assessment Of The Level Of Noise From Base Transceivers' Station Using Geospatial Techniques: In Abuja Municipal Area Council.

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**Abstract:** Given the mode of operation of Global System for Mobile(GSM) technology, Base Transceivers' Stations (BTS) are required for the provision of GSM service, consequently the network of base stations are established in areas that enjoyed the GSM service all over Nigeria. With the erratic situation of electricity supply in Nigeria, the telecommunication companies ensure that there is no break in transmission in their services due to power failure. These telecommunication providers made available diesel plants for constant electricity supply to their Base Transceivers' Stations in order to maintain efficiency in their services. This study is aimed at investigating the level of noise pollution from Base Transceivers Stations in Abuja Municipal Area Council (AMAC), it encompasses the identification and inventory of the spatial pattern of BTS in the study area, analyze the noise level associated with the existing location of BTS and also to map areas that are vulnerable to health hazards related to noise pollution from these BTS. The noise pollution generated from these diesel plants is hazardous to health. There are over one hundred and twenty six BTS in AMAC Abuja, which are all being serviced by diesel plant. The National Environmental Standard and Regulatory Enforcement Agency (NESREA) established a guideline of the level of noise at 65 decibels at daytime and 45 decibels at nights is required in residential environment in Nigeria. It was deduced that out of 126 diesel plant at BTS locations, 43 diesel plant at BTS location failed night-time standards but met the day-time standard while 83 diesel plants at BTS location failed both day-time and night-time NESREA standard of the level of noise respectively at a distance of 10m. At 20m distance from the BTS, the whole of the 126 diesel plants at BTS location failed for the night-time standard but passed for day-time standards.

**Key Words:** Base Transceiver Station, Environment, Telecommunications, Diesel Plant, Noise Pollution.

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### I. Introduction

In the process of solving a problem, we intentionally or unintentionally create more problems (Aderoju, 2012). This has been the trend of civilization throughout the globe. The concentration of environmental pollution is significantly increasing and causing serious threat to the quality of the environment. Recent studies have illustrated a link between human exposure to noise and negative effects on their health.

Noise pollution in large urban areas is regarded as a growing problem of communities. Present studies shown that more than 20 % of the world population lives under unacceptable noise levels and nearly 60% of the European population is exposed to high noise levels during the day (Silvia, 2003). In 2002, Plog *et al*, defined noise as a word often used to mean unpleasant sound that the listener does not want to hear. They further stated that although there are no physical characteristics distinguishing noise from wanted sound. Noise pollution is not unique or peculiar to developing countries alone; it is a common occurrence and of highest magnitude in most of the advanced countries. For instance, China until the third century BC of its existence had used noise for torturing instead of hanging men for dangerous crime (Kapoor and Singh, 1995). Similarly in India, not until of late when most of the people do not consider noise as pollutant and take it as part of life routine, noise was before considered gravious just like any other serious crime (Nagi *et al*, 1999).With the erratic power supply in the country, all the communication companies power their Base Transceivers Stations (BTS) with diesel plants all through the day in order to avoid failure in transmission in their services. These infrastructures have influenced the surroundings both positively and negatively. The extent of noise generated from diesel plants has a serious adverse effect on human health and the environment as a whole. Hence it is important to study the possible adverse effects on the environment. These effect studies will support in decision making process. Stoter in 1999 also stated that noise pollution is one of the most important factors to be considered in the study on new infrastructure. Noise pollution standards differ from country to country. The used noise models and the legislation on noise pollution are different for each country. In Nigeria, telecommunication growth is exponential with numbers of service providers like MTN, Airtel, Etisalat, Visafone, Multilinks and Globalcom.

Hence there is need to monitor and manage the level of noise in our environment for health reasons and also for our environmental sustainability.

GIS can be a very useful tool to monitor the noise effects on the environment. Geospatial Information Systems (GIS) can be effectively used in the gathering, weighting, analyzing and presenting spatial and attribute information to facilitate the management of environmental pollutions (Alesheikh *et al.*,2007). The use of GIS can increase the quality of the study on noise pollution. This will support environmental management.

## II. Study Area

Federal Capital Territory is the home of Abuja, the capital of Nigeria it is bordered to the north by Kaduna State, to the east by Nassarawa State, to the south-west by Kogi State and to the west by Niger State. The FCT is located in the centre of the country in the guinea savannah of the middle belt. It is comprises of six local government councils which are; AMAC, Kuje, Gwagwalada, Bwari, Abaji and Kwali. It lies between longitudes  $6^{\circ} 20'E$  and  $7^{\circ} 33'E$  of the Greenwich Meridian and with latitudes  $8^{\circ} 30'N$  and  $9^{\circ} 20'N$  of the equator. It occupies an area of about  $8000\text{km}^2$ .

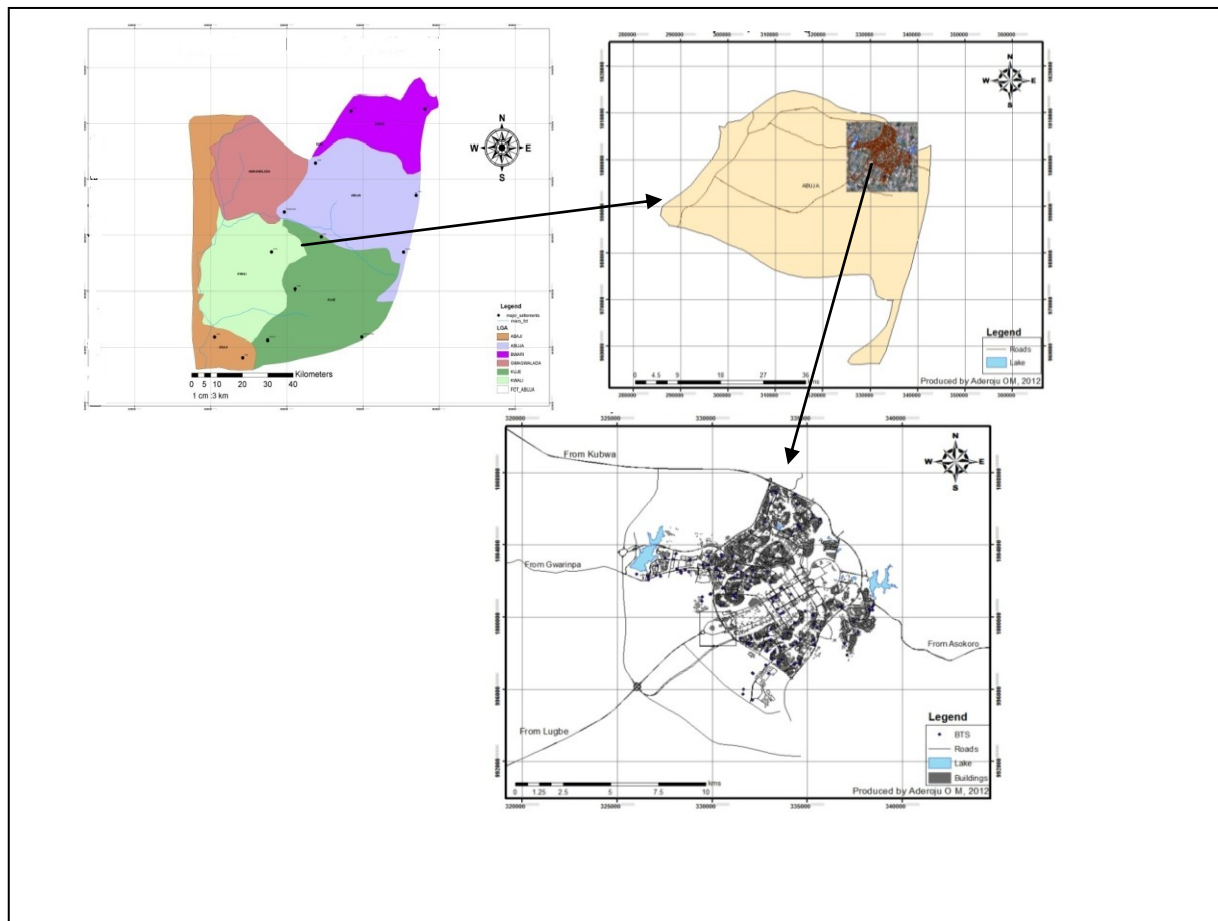


Figure 1.0: Study Area Map

## III. Literature Review

### 3.1 Noise and Noise Pollution

Noise can simply be described as an unpleasant sound that gives a disturbing and an annoying effect to the listener. From the acoustics point of view, **sound** and **noise** constitute the same phenomenon of atmospheric pressure fluctuations about the mean atmospheric pressure; the differentiation is greatly subjective (Hansen, 1998).

Noise is a number of tonal components disagreeable to man and more or less intolerable to him because of the discomfort, fatigue, disturbances and, in some cases, pain it cause (Hamza, 2008). Noise pollution in a simple term can also be described as a type of distracting sounds which are clearly audible and which may result in disturbing any natural environment and causes deafness in human. It may also cause disrupt sleep and prevent some level of growth in children due to its continuous loud nature. A study by Singh and

Mahajan (1990) conducted in Delhi and Calcutta; found that the noise level is 95dB as against the ambient limit of 45dB. Even at the "calm" places, it does not fall below 60dB.

The worrisome effects of noise are dangerous enough that noise problem is considered next to crime by certain countries (Kapoor and Singh, 1995). Bond, (1996) reports that 16% of people in Europe are exposed to 40 dB or more of traffic noise in their bedrooms at night compares it with W.H.O.'s average estimates of 30 to 35 dB for undisturbed sleep. Several initiatives have been taken by various countries to check the noise level. For instance, USA has taken initiative to create sites where human-caused noise pollution will not be tolerated (Geary, 1996).

### 3.2 Noise Pollution and Diesel Generator Plants

Electric energy occupies the top grade in energy hierarchy as it finds innumerable uses in homes, industry, agriculture, and defense and of course in some nations, transportation. Nigeria's electricity power situation is very poor because of erratic power supply. As a result there is an upsurge in the use of electricity generating plant with its attendant noise pollution on the environment and human health. Most workplaces and homes use generating plants 24 hours in alternative to power supply (Akinbulire *et al*, 2010). In Nigeria, virtually all the telecommunication companies (service providers) use diesel plants as an alternative source of power for their Base transceivers stations to provide efficient services to their customers.

### 3.3 Harmful Effects of Noise

Existing evidence indicating that noise pollution may have negative impacts on human health has justified research in order to provide better understanding of noise pollution problems and control (Georgiadou *et al*. 2004). Noise pollution has been stated as a serious health hazard, with noise-related damage to humans ranging from annoyance to difficulty in falling asleep and high blood pressure (Ugwuanyi *et al*. 2004; Saadu *et al*. 1998; Ahmad *et al*. 2006; Schwela and Zali 1999).

Also in 1999, Schwela and Zali stated that the effects of Noise Pollution on Human Being and its environs is as follows;

**It causes Blood Pressure:** - Noise Pollution causes certain diseases in human. It attacks on the person's peace of mind. The noises are recognized as major contributing factors in accelerating the already existing tensions of modern living. These tensions result in certain disease like blood pressure or mental illness etc.

**Temporary or permanent Deafness:-** The effect of noise on audition is well recognized. Mechanics, locomotive drivers, telephone operators etc. All have their hearing impairment as a result of noise at the place of work. Physicist, physicians & psychologists are of the view that continued exposure to noise level above 80 to 100 db is unsafe, loud noise causes temporary or permanent deafness.

**Effect on Vegetation poor Quality of Crops:** - Now is well known to all, that plants are similar to human being. They are also as sensitive as man. There should be cool & peaceful environment for their better growth. Noise pollution causes poor quality of crops in a pleasant atmosphere.

### 3.4 Act and Standards for Noise Pollution in Residential Areas

However in 2007, the National Assembly enacted a law creating the National Environmental Standards and Regulations Enforcement Agency (Establishment) Act (NESREA) which states that the law provides that:

- (a) The Agency shall, on the commencement of this Act, in consultation with appropriate authorities:
- (b) Identify major noise sources, noise criteria and noise control technology; and
- (c) Make regulations on noise, emission, control, abatement, as may be necessary to preserve and maintain public health and welfare.
- (d) The Agency shall enforce compliance with existing regulations and recommend programmes to control noise originating from industrial, commercial, domestic, sports, recreational, transportation or other similar activities.

The National Environmental Standards and Regulation Enforcement Agency stated in its regulations that Daytime level of noise should not exceed 65 decibels and Night-time at 45 decibels at residential, schools and hospital and many among others.

## IV. Research Methodologies

**Data Acquisition and Data Sources:** The data used for this study were obtained from both primary and secondary sources. The primary sources involved the use of GPS receiver to obtain the coordinates of Base Transceivers Stations (BTS) in the study area, the SU 130 LEQ-Noise meter was used to measured the level of noise from diesel generator plants from BTS, and also personal interviews with station engineers of MTN and Etisalat, guards at the BTS locations and also some inhabitants around the identified BTS locations.

The secondary data used is a high resolution satellite imagery of the NigeriaSat-2 with a resolution 2.5m in panchromatic and 5m multispectral. The imagery was obtained from the National Space Research and Development Agency (NASRDA), Abuja.

### Field Survey

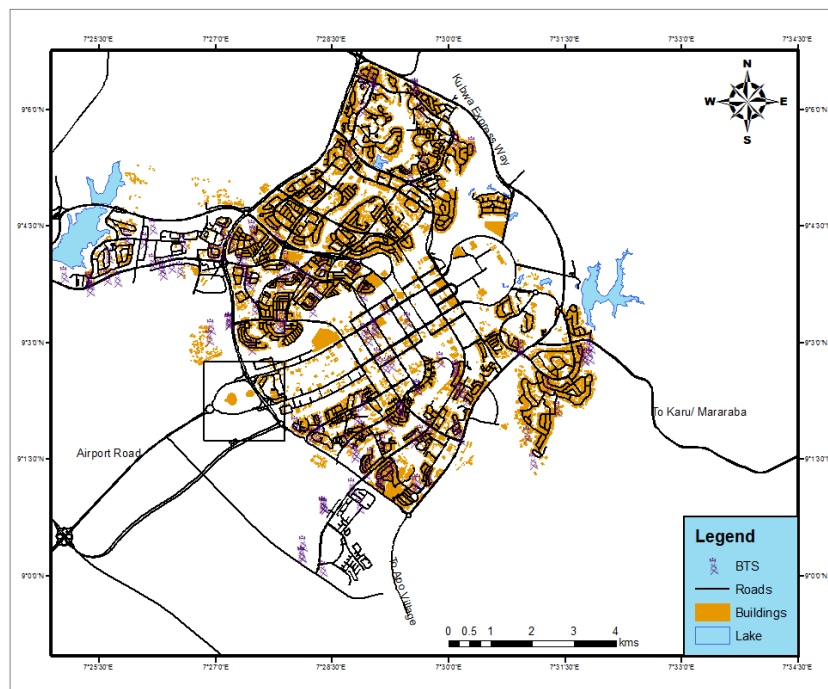
The study area was divided into districts to ensure accuracy and also avoid duplicating efforts. The use of a Global Positioning Systems (GPS) to obtain coordinates on all the location of the BTS in the study area and the SU 130 LEQ-Noise meter was used to measure the noise level at distances 10m and 20m away from the identified BTS. Personal interviews with the some MTN, GLO and Etisalat engineers, BTS guards and some inhabitants living around Base Transceivers Station in the study area to obtain information on the Base Transceivers Station (BTS) itself.

### Data Processing and Georeferencing

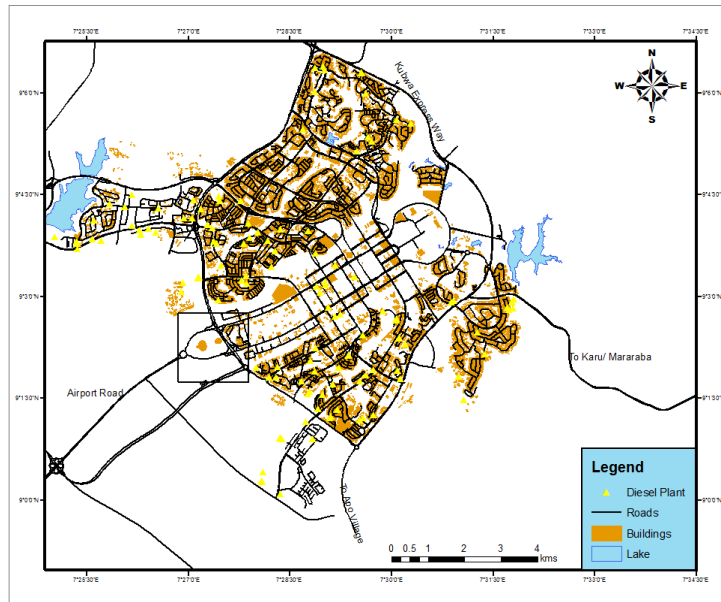
Data processing (Georeferencing and on screen digitizing): Georeferencing of the satellite image was required so as to bring them to the same ground coordinates. The georeferencing of the satellite image was done using the ArcGIS software. The projection of the datasets was projected to WGS 1984, Universal Transverse Mercator, Datum 100 Minna –Nigeria, Zone 32<sup>0</sup>N. The georeferencing began with the selection of four X and Y coordinates tie points that are spatially distributed and points were added, and map was then rectified. GPS coordinates of BTS obtained during the study site survey was plotted on the image.

## V. Geospatial Analysis:

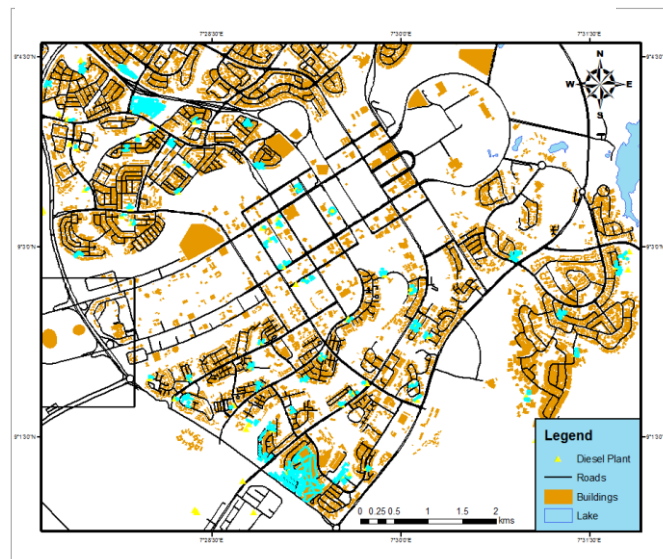
The buffering of 10m and 20m was done around the Base Transceivers Stations (BTS) then a proximity analysis was done around the diesel plants in base stations to residential areas.



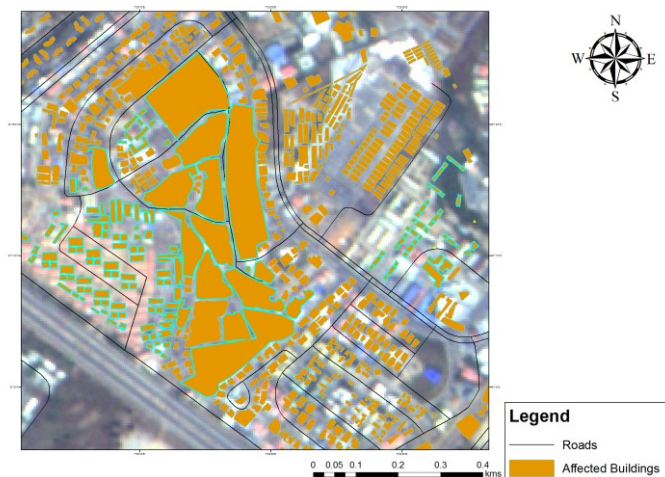
**Figure 2:** BTS locations in AMAC phase 1, Abuja



**Figure 3:** Diesel Plants location at BTS in AMAC Phase 1, Abuja



**Figure 4:** Highlighted in blue-green colour shows the affected buildings @ both 10m and 20m distance



**Figure 5:** Highlighted in blue-green colour shows the affected buildings at closer view

It was observed that out of the one hundred and twenty six (126) BTS in AMAC Abuja, which are all being serviced by diesel plant. Analysis and readings from the Noise meter device showed that at 10m distance away, 43 diesel plant at BTS location failed to meet the night-time NESREA standard of level of noise at 45 decibels but met the day-time standard of 65db while 83 diesel plants at BTS location failed to meet both day-time and night-time NESREA standard of the level of noise respectively. At 20m distance away, analysis and readings from the device showed that the whole of the 126 diesel plants at BTS location failed for the night-time NESREA standard at 45 decibels but also the whole 126 diesel plants at BTS passed for day-time NESREA standards at 65 decibels. This in simple term reveals that the farther people live away from BTS the less level of noise they tend to experience from diesel generator plants from BTS because of the electric power challenges the telecommunications service provider would never want to compromise their efficiency and reliability.

## VI. Conclusions

In conclusion it has been revealed according to this study that the noise level coming from diesel plant located at base transceivers stations is dangerous to the surrounding inhabitants especially to human health. The research also observed that the most areas affected cannot be easily redeveloped by the introduction of facility “pertinent zones” suitable to the urban characteristics of the specific areas, it is necessary to think of recovery plans. This phase should come after the drafting of a noise map which this research has studied. The service providers have also compromised the standard on the level of distance for locating these base stations which if there are natural disaster there residents will be at risk. The regulatory authorities responsible (NESREA) should strictly enforce the penalties for violating the standard for further siting of these base stations.

| Field Work Data |           |          |               |                  |                  |  |  |  |
|-----------------|-----------|----------|---------------|------------------|------------------|--|--|--|
| S/N             | Northings | Eastings | Elevation (m) | Service Provider | Residential Type |  | Diesel Plant Noise level @ 10m buffers away from BTS (dB). | Diesel Plant Noise level @ 20m away (dB) |
| 1               | 333775    | 997811   | 517           | MTN & VISAFONE   | Medium           | Plot 289 Enugu street Garki                            | 65   | 47                                       |
| 2               | 333657    | 997650   | 517           | MTN              | Medium           | Model primary school Garki 2                           | 63   | 47                                       |
| 3               | 333480    | 997478   | 518           | ETISALAT         | Medium           | Garki 2 police HQ                                      | 63   | 48                                       |
| 4               | 333467    | 997432   | 516           | GLOBACOM         | Medium           | Garki 2 police HQ                                      | 71   | 46                                       |
| 5               | 334278    | 997363   | 517           | GLOBACOM         | Medium           | 6 Sapele Street beside NURTW, Garki.                   | 68   | 48                                       |
| 6               | 334372    | 997424   | 517           | MTN              | Medium           | NSPMC qtrs Garki 2                                     | 71   | 46                                       |
| 7               | 334625    | 997507   | 515           | MTN              | Medium           | Ladoke Akintola boulevard way Garki                    | 68   | 49                                       |
| 8               | 335361    | 998494   | 517           | MTN              | Medium           | AMMA center plaza Mohammadu Buhari way                 | 67   | 46                                       |
| 9               | 335296    | 998724   | 516           | GLOBACOM         | Medium           | 50 Oro Ago Street                                      | 70   | 49                                       |
| 10              | 332816    | 997329   | 518           | MTN              | Medium           | Plot 986 Gudu district legislative Qtrs off Apo        | 63   | 46                                       |
| 11              | 332159    | 996868   | 524           | GLOBACOM         | Low              | Durumi hill  | 70   | 47                                       |
| 12              | 332149    | 996878   | 526           | MTN              | Low              | Durumi hill  | 70   | 49                                       |
| 13              | 332125    | 996899   | 526           | AIRTEL           | Low              | Durumi hill  | 70   | 50                                       |
| 14              | 332119    | 996903   | 526           | VISAFONE & MULTI | Low              | Durumi hill  | 70   | 49                                       |
| 15              | 332116    | 995389   | 484           | GLOBACOM         | Medium           | Anon plaza 1085 gudu district                          | 72   | 48                                       |
| 16              | 331617    | 995717   | 486           | MTN              | High             | 54 David Ejoor crescent Gudu                           | 69   | 49                                       |
| 17              | 331609    | 995722   | 483           | ETISALAT         | High             | 54 David Ejoor crescent Gudu                           | 67   | 47                                       |
| 18              | 331638    | 995980   | 493           | GLOBACOM         | High             | 195 Durumi 2 by pry school                             | 70   | 49                                       |
| 19              | 332978    | 996868   | 494           | ETISALAT         | High             | Apo legislative qtrs zone A(sentosa park & Recreation) | 67   | 46                                       |
| 20              | 335341    | 999582   | 520           | AIRTEL           | High             | 9 porthacourt crescent Garki off gimbiya street        | 66   | 49                                       |
| 21              | 335349    | 999590   | 519           | GLOBACOM         | High             | 9 porthacourt crescent Garki off gimbiya street        | 68   | 50                                       |
| 22              | 335522    | 999424   | 523           | MTN              | High             | 11 kukawa street off                                   | 70   | 48                                       |

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|    |        |         |     |  |      |   |    |    |
|----|--------|---------|-----|--|------|---|----|----|
|    |        |         |     |  |      | gimbiya   |    |    |
| 23 | 331828 | 998536  | 485 | MTN                                    | High | Area 1, Junction                                  | 78 | 49 |
| 24 | 331996 | 998551  | 482 | VISAFONE                               | High | Shehu shagari isalamic center                     | 71 | 48 |
| 25 | 332944 | 998988  | 485 | MTN                                    | High | Along J.S Tarka Street                            | 65 | 49 |
| 26 | 333048 | 998709  | 491 | MTN                                    | Low  | Shehu shagari isalamic center                     | 68 | 47 |
| 27 | 332694 | 998429  | 466 | MTN                                    | Low  | First bank Area 3 Garki                           | 72 | 49 |
| 28 | 333974 | 999141  | 510 | ETI, MTN, VISA                         | Low  | Mosque Area 8 Opposite Sterling Bank              | 69 | 50 |
| 29 | 334359 | 999677  | 511 | GLOBACOM                               | Low  | 74 Emeka Anyanwu Street                           | 70 | 46 |
| 30 | 334144 | 1001273 | 526 | VISAFONE                               | Low  | Federal Motage Bank                               | 72 | 49 |
| 31 | 333625 | 1001581 | 509 | MTN                                    | Low  | TOFA House CBD                                    | 68 | 46 |
| 32 | 333083 | 1001912 | 500 | ETI, MTN, VISA, MULT                   | High | Ibrahim Abacha Estate Wuse Zone 4                 | 65 | 49 |
| 33 | 332900 | 1002530 | 510 | GLOBACOM                               | High | 5 Port said Street                                | 68 | 48 |
| 34 | 332140 | 1002564 | 497 | ETI, MTN,                              | Low  | 15 Zigunchor street                               | 69 | 47 |
| 35 | 331525 | 1002488 | 473 | ETI, MTN, VISA, MULT                   | Low  | Accra park Zone 5                                 | 73 | 48 |
| 36 | 331315 | 1002348 | 471 | MTN                                    | Low  | Accra park Zone 5                                 | 68 | 49 |
| 37 | 331140 | 1002174 | 472 | AIRTEL                                 | Low  | 37 Khartoun street Zone5                          | 68 | 48 |
| 38 | 331198 | 1001305 | 488 | GLOBACOM                               | High | Orange garden Zone 2                              | 70 | 47 |
| 39 | 331797 | 1002258 | 489 | ETI                                    | High | Fire service station Zone 3                       | 72 | 49 |
| 40 | 332000 | 1001963 | 492 | ETI                                    | High | 7 idimba street wuse zone 3                       | 67 | 47 |
| 41 | 331895 | 1001541 | 482 | MTN                                    | High | 23 Abidjan street wuse zone 3                     | 57 | 47 |
| 42 | 331275 | 1002730 | 474 | GLOBACOM                               | High | Plot 2B Herbert Marculay wuse zone 5              | 60 | 49 |
| 43 | 330486 | 1003471 | 513 | MTN                                    | High | Unity Park wuse zone 6                            | 73 | 46 |
| 44 | 330506 | 1003352 | 498 | ETISALAT, MULTILINKS                   | High | 5 Nyala street wuse zone 6                        | 71 | 48 |
| 45 | 331062 | 1003352 | 498 | MTN                                    | High | Cotonu crescent chinox guest inn zone 6           | 69 | 49 |
| 46 | 329983 | 1003119 | 480 | GLOBACOM                               | High | 23 Yaoundé street zone 6                          | 51 | 48 |
| 47 | 330164 | 1002686 | 473 | STARCOM, GATEWAY                       | High | Total filing station zone 6                       | 64 | 47 |
| 48 | 330289 | 1002614 | 473 | AIRTEL                                 | High | Chicken republic zone 6                           | 66 | 48 |
| 49 | 330420 | 1002188 | 475 | GLOBACOM                               | High | Copper house Zone 5                               | 58 | 48 |
| 50 | 330323 | 1002249 | 481 | MTN                                    | High | Opp. Copper house, Zone 5                         | 55 | 49 |
| 51 | 330535 | 1001581 | 462 | MTN                                    | High | plot 5 Michael Okpara street wuse zone 5          | 60 | 47 |
| 52 | 330443 | 1000646 | 483 | GLOBACOM                               | High | 53 lome crescent princess suite Zone 7            | 70 | 48 |
| 53 | 331219 | 1001089 | 488 | MTN                                    | High | Amusement park zone 1                             | 51 | 49 |
| 54 | 331082 | 1001189 | 489 | ETISALAT, AIRTEL, STARCOM, VISA, MULTI | High | Amusement park zone 1                             | 67 | 47 |
| 55 | 329520 | 1002883 | 477 | AIRTEL                                 | High | Moses majekodunmi str, Golden astoria hotel Utako | 69 | 48 |
| 56 | 329743 | 1002883 | 475 | ETISALAT                               | High | B12,33 utako (Friday mosque)                      | 74 | 48 |
| 57 | 329786 | 1003377 | 473 | MTN                                    | High | 2 Bukar Dipcharma str, Taslim O elias Utako       | 58 | 47 |
| 58 | 328845 | 1003156 | 460 | MTN                                    | High | plot 367 Augustus aikomu way utako                | 69 | 49 |
| 59 | 327932 | 1003189 | 450 | AIRTEL                                 | High | plot 224 solomonla way utako, Chida hotel         | 65 | 46 |
| 60 | 328119 | 1003522 | 444 | MTN                                    | Low  | Behind, NHIS office                               | 72 | 47 |

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|    |        |         |     |   |        |  |    |    |
|----|--------|---------|-----|---|--------|--|----|----|
|    |        |         |     | VISAFONE,<br>ETISALAT,<br>MTN,<br>MULTIINKS,ST<br>ARCOM |        | utako District   |    |    |
| 61 | 328122 | 1002682 | 443 |   | High   | opp jabi park Utako                                      | 58 | 47 |
| 62 | 328364 | 1002429 | 450 | Pocom   | High   | B division Utako<br>district command                     | 54 | 49 |
| 63 | 328333 | 1002560 | 450 | MTN   | High   | plot 6 etuknam str,<br>Abraham plaza<br>Utako            | 65 | 48 |
| 64 | 328781 | 1002502 | 455 | MTN   | High   | 29 F okotie ebo<br>Cresent                               | 60 | 47 |
| 65 | 328579 | 1002605 | 460 | AIRTEL,<br>MULTILINKS                                   | High   | 26 A E Ekukinam<br>Street Utako.                         | 57 | 47 |
| 66 | 326619 | 1002251 | 453 | MTN   | High   | 9 mike Akhigbe<br>street Utako                           | 59 | 48 |
| 67 | 326646 | 1002209 | 457 | MTN,<br>MULTILINKS                                      | High   | 1 Emmanuel Adiele<br>str utako.                          | 66 | 46 |
| 68 | 326632 | 1002049 | 458 | GLOBACOM  | High   | Plot 693 obafemi<br>awolowo way zone<br>B4 Utako         | 74 | 48 |
| 69 | 326030 | 1002387 | 447 | AIRTEL  | High   | Richard Akinjide<br>street                               | 59 | 49 |
| 70 | 327037 | 1002323 | 468 | ETISALAT  | High   | 16 Ebitu Ukiwe str,<br>Jabi district.                    | 60 | 47 |
| 71 | 327098 | 1002836 | 457 | MTN   | High   | 27 A Sheik Jarma<br>street                               | 58 | 49 |
| 72 | 327523 | 1003287 | 464 | MTN   | High   | 9 Adamu Chiroma<br>cresent                               | 70 | 48 |
| 73 | 327297 | 1002270 | 461 | MTN   | High   | Blk C2 zigma estate                                      | 66 | 47 |
| 74 | 329918 | 1001271 | 455 | VISAFONE,<br>ETISALAT,<br>MTN,<br>MULTILINKS            | High   | Wuye junction  | 61 | 49 |
| 75 | 329923 | 1001283 | 455 | GLOBACOM  | High   | Wuye junction  | 55 | 47 |
| 76 | 329898 | 1001250 | 455 | AIRTEL  | High   | Wuye junction  | 74 | 48 |
| 77 | 329496 | 1001120 | 452 | AIRTEL  | High   | plot 111 Peace<br>Heaven Wuye.                           | 53 | 47 |
| 78 | 329464 | 1000879 | 459 | MTN   | High   | Cassava Street Wuye<br>plot 674                          | 66 | 47 |
| 79 | 333124 | 997678  | 505 | Unknown   | High   | CBN quarters   | 72 | 48 |
| 80 | 333251 | 998074  | 503 | AIRTEL  | High   | IQ Academy school<br>benin kebbi cresent                 | 59 | 49 |
| 81 | 333545 | 998351  | 506 | Unknown   | High   | On top of house 6<br>NISE close wuse                     | 61 | 48 |
| 82 | 332916 | 998156  | 508 | Unknown   | High   | Government science<br>and technical college              | 57 | 49 |
| 83 | 332874 | 998085  | 507 | MTN   | High   | Government science<br>and technical college              | 61 | 46 |
| 84 | 334265 | 998431  | 508 | Unknown   | High   | Plot 1350 Ahmadu<br>Bello way garki 2                    | 56 | 47 |
| 85 | 334426 | 998601  | 512 | MULTILINK   | High   | Oando filling station<br>garki 2                         | 55 | 49 |
| 86 | 334630 | 998741  | 508 | MTN   | High   | Inside garki<br>supermarket                              | 73 | 48 |
| 87 | 333716 | 998802  | 489 | GLOBACOM  | High   | House 2 Eket close<br>Garki                              | 70 | 47 |
| 88 | 333981 | 999127  | 509 | GLOBACOM  | Low    | Federal capital<br>territory judiciary<br>customary cork | 60 | 48 |
| 89 | 334363 | 999682  | 517 | GLOBACOM  | Low    | Tafawa balewa<br>road,inside<br>moneygram office         | 59 | 49 |
| 90 | 334904 | 1000320 | 519 | MTN   | Medium | Inside NTA head<br>quarters                              | 61 | 48 |
| 91 | 335280 | 1000126 | 525 | Unknown   | High   | Area 2 District  | 57 | 49 |
| 92 | 335281 | 1000075 | 529 | Unknown   | Low    | Mangal plaza Area 11<br>garki                            | 58 | 47 |
| 93 | 337092 | 997902  | 568 | MTN   | Low    | Dapa bireye str,Near<br>AIT office, Asokoro              | 70 | 47 |
| 94 | 336954 | 998542  | 571 | MTN   | Low    | Justice fatai william<br>Street , Asokoro                | 66 | 48 |
| 95 | 337674 | 999157  | 557 | Unknown   | Low    | Mamman Nasir<br>Street, Asokoro.                         | 54 | 48 |
| 96 | 337457 | 999739  | 546 | Airtel  | Low    | gnassingbe eyadema<br>str, Asokoro.                      | 63 | 46 |



|     |        |         |     |                           |      |   |    |    |
|-----|--------|---------|-----|---------------------------|------|---|----|----|
| 97  | 338443 | 1000386 | 600 | GLOBACOM                  | Low  | By police station Asokoro   | 61 | 47 |
| 98  | 338407 | 1000568 | 580 | GLOBACOM                  | Low  | By police station Asokoro   | 72 | 49 |
| 99  | 338468 | 1000645 | 580 | MTN                       | Low  | By police station Asokoro   | 70 | 48 |
| 100 | 338276 | 1000425 | 557 | MTN                       | Low  | Haile selassie street Asokoro   | 58 | 47 |
| 101 | 338309 | 1000350 | 573 | GLOBACOM                  | Low  | Haile selassie street Asokoro   | 65 | 48 |
| 102 | 336823 | 1000600 | 523 | G cell                    | Low  | plot 384, J F kennedy street Asokoro                                    | 69 | 47 |
| 103 | 336763 | 1000573 | 534 | MTN                       | Low  | plot 384, J F kennedy street Asokoro                                    | 55 | 48 |
| 104 | 331466 | 998821  | 501 | Unknown                   | Low  | African safari hotel limited area1                                      | 54 | 48 |
| 105 | 332049 | 998823  | 484 | ETISALAT                  | Low  | Dummec plaza Area I   | 70 | 48 |
| 106 | 333082 | 999341  | 491 | Unknown                   | High | Number 4, borno street, on top of a two storey building, area 10, Garki | 59 | 47 |
| 107 | 333608 | 1000189 | 505 | ETISALAT                  | Low  | Close to chelsea hotel  | 67 | 46 |
| 108 | 333743 | 1000249 | 504 | Unknown                   | Low  | Annexa metro plaza  | 73 | 48 |
| 109 | 333423 | 1000446 | 498 | Unknown                   | Low  | Ahmadu coomasie house   | 59 | 49 |
| 110 | 333211 | 1000843 | 496 | Unknown                   | Low  | Behind nicon plaza  | 54 | 48 |
| 111 | 333115 | 1001014 | 498 | Unknown                   | Low  | IGI central area  | 53 | 49 |
| 112 | 333345 | 1001138 | 501 | Unknown                   | Low  | Inside total office central area  | 55 | 47 |
| 113 | 333352 | 1001045 | 515 | Unknown                   | Low  | Behind total building Ajib building, central Area                       | 69 | 49 |
| 114 | 333084 | 1006955 | 520 | Unknown                   | Low  | Ibrahim babangida way, Maitama  | 71 | 48 |
| 115 | 333320 | 1006980 | 570 | MULTILINK                 | High | Tennese crescent, Maitama   | 70 | 49 |
| 116 | 333350 | 1006879 | 567 | Unknown                   | Low  | Ibrahim babangida booloryard, Maitama                                   | 63 | 48 |
| 117 | 334351 | 1006803 | 553 | Unknown                   | Low  | Opposite Samsung building, Maitama Mpape junction                       | 56 | 47 |
| 118 | 334348 | 1006810 | 548 | MTN                       | Low  | Mpape junction  | 67 | 47 |
| 119 | 335292 | 1005523 | 514 | GLOBACOM                  | High | Inside model primary school Maitama                                     | 54 | 48 |
| 120 | 335688 | 1005433 | 501 | MTN and AIRTEL            | Low  | Opposite Philipines embassy, Maitama                                    | 60 | 49 |
| 121 | 334475 | 1006257 | 549 | MTN                       | High | Rima street, Maitama  | 68 | 47 |
| 122 | 333081 | 1006292 | 520 | MTN, ETISALAT AND STARCOM | Low  | Alvan ikoku way, Maitama  | 65 | 47 |
| 123 | 332753 | 1005279 | 521 | MTN                       | High | African Safari hotel, mekong street, Maitama                            | 71 | 48 |
| 124 | 334214 | 1004674 | 521 | MULTILINK                 | High | 2507 imani estate, off british counsel, Maitama                         | 56 | 49 |
| 125 | 334532 | 1005059 | 532 | AIRTEL                    | High | Salem guest house, Maitama  | 67 | 48 |
| 126 | 334623 | 1004951 | 498 | MTN                       | High | Star Lake Close, House 6, komoe crescent, Maitama                       | 58 | 47 |

**Table 1.0:** Showing Noise meter readings @ 10m and 20m respectively

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