



Environmental Impact of Telecom Installations: A Call for an Aggressive Legal Solution

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ABSTRACT

Human need may be difficult to attain when there is no means of communication among them. Language, therefore, has been an age long means of communicating among human beings. It is used to easily pass a message to another person who is physically present and understands the language. Where the person to whom a message is to be passed is not physically present, the message is sent through another person who takes the message and delivers same to him physically. The delay and inefficiency associated with primordial way of communicating with person in distance necessitated the need to device a means by which person in distance place can be instantly communicated with as if he is present.

One of such newly devised ways is known as telecommunication. Telecom makes use of radiofrequencies and microwaves to enable people at different places communicate easily. To ensure clearer reception of signal from one end to another, certain infrastructures or facilities i.e. masts, towers, optical cable, power generating set, e.t.c are installed and put in place. In the process of installation of the infrastructures and their operations, certain environmental challenges ensue; and how these challenges are addressed and catered for via the laws and regulations as well as the actual practice shall be focus of this paper.

KEYWORDS: Global System for Mobile Telecommunication (GSM), Mobile Switching Centre (MSC), The Mobile System (MS), Base Station Subsystem (BSS), Environment Impact Assessment (EIA).

INTRODUCTION

The important of communication in human life cannot be overemphasis. So also the importance of communicating with the people in distanced place with their instance responses. This ability to communicate with people from far distance with instance response is one of the goodies of telecommunication. However, as it is almost impossible that a particular beneficial development will not have some side effects, the invention of telecommunication as beneficial as it is to the mankind has some negative impact on human environment. The crux of this paper is therefore, shall be the legislative efforts to prevent or mitigate these negative environmental impacts and the actual practice in the industries.

Meanwhile, the approach in this paper will be the examination of certain concepts of the topic, the explanation of the GSM architectures/installations, the environmental impacts of telecom installations, the laws to address them and the actual practice of the key players. In concluding the paper recommendations and suggestions shall also be proffered.

Conceptual Definition of the Terms in the Topic

Before delving properly into this paper, it is thought expedient to have the contextual understanding of some concepts in the topic i.e. environment, telecom installations, law and machinery, and practice

Environment

Environment can be described as the totality of our surroundings. Several attempts have been made to define environment in our laws. For instance, environmental impact assessment Act, Cap E12, LFN, 2004 defines environment as 'component of the earth, and includes - (a) land, water and air, including all layers

of the atmosphere; (b) all organic and inorganic matter and living organism; and (c) the interacting natural system that include component referred to in

Paragraphs (a) and (c)¹

The context of the above definition is adopted by the National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, NESR²EA) 2007². For the purpose of this paper therefore, Environment will be viewed from the totality of our surroundings.

Telecommunication

The word Telecommunication is distilled from the words ‘tele’ and ‘communication’. Tele means over a long distance or ³far³ while communication on other hand means the activities or process of expressing ideas or feelings or of a given people informati⁴on.⁴ Communication is also defined to mean communication whether between persons or and persons, things and things, or person and things, in the form of sound, data, text, visual images, signals or any other form or any combination of those forms⁵.

Therefore, Telecommunication may be defined as the sending of signals, visual images, sound, data, text and messages over long distances by the aid of technology such as radio, telephone, television, satellite e.t.c.

Installation

Installation means the act of fixing equipments in position so that it can be used.⁶ in the context of this paper; installation will be defined to mean a piece of equipment or machinery that has been fixed in a position for the purpose of it being used⁶.

Law, Machinery and Practice

According to Black Law Dictionary, 8th edition, page 900, law is defined from different perspective. Law is defined as the regime that orders human activities and relations through systematic application of the force of politically organised society, or through social pressure, backed by force, in such a society. Law can also mean the aggregate of legislation, and accepted legal principle, the body of rules, standards, and principles that that the court applies to settle issues brought before them. It may also mean the set of rules dealing with specific areas of a legal system. Machinery means the system, structure and mechanism of doing things. Practice may be described as a way of doing things in a usual or expected manner.

Telecommunication/GSM Architecture

As earlier described, telecommunication is a way of sending signals, visual images, data, sound e.t.c. over a long distance through the use of technology. The telecommunication may be one-way process like Radio and Television broadcasting; and it may be two – way process like telephone where the parties at the two distanced ends can be communicating instantly. Telecommunication may be wired or wireless. The gradual development of telecommunication has lead to what is known today to as Global System for Mobile Communication (GSM).

It is to be noted that because telecommunication makes use of technology, its efficacy and efficiency depends on the facilities or equipments put in place. In other words, effective telecommunication system requires the provision of some equipments or facilities working alone or in most cases in connection with each other to order to achieve the require result. These equipments or facilities are what are described as Telecommunication Installations. To fully appreciate what telecommunication installation are, one needs to appreciate the way GSM works through its architecture.

The working of the GSM network is anchored on different facilities and systems the totality of which is referred to as GSM architecture. The GSM architecture is composed of several functional entities with separate and distinct functions. There are three broad parts of GSM architecture: the Mobile Station (MS),

¹ See: Section 61

² See: Section 37. This provision also defines the environment to include water, air, land, and every other thing living therein. It should be noted that virtually all the regulations made pursuant to NESREA Act also adopt the concept of this definition.

³ Oxford Advanced Learner’s Dictionary, 6th edition, page 1230.

⁴ 4 Ibid, page 225.

⁵ See: Section 156 of the Nigerian Communication Act, 2003.

⁶ 6 Oxford Advanced Learner’s Dictionary, 6th edition, page 621.

Base Station Sub-System (BSS) and network subsystem (NSS)⁷, the Mobile Station (MS) includes Radio equipment that a subscriber needs in order to access the service provided by GSM operator. The MS can be installed in vehicles or can be portable handheld station i.e. handset. The primary functions of MS are to transmit and receive voice and data over the air interface of the GSM system. MS performs the signal processing function of digitizing, encoding, error protecting, encrypting, and modulating the transmitted signals⁸. The Base Station Subsystem consists of two components: Base Transceiver station (BTS) and Base Station Controller (BSC). The BTS houses the radio transceiver that communicates with the MS while the BSC manages the communication between one or more BTSs. The Network Subsystem consists majorly the Mobile Service Switching Center (MSC). Here the functionalities like registration, authentication, location updating, hand over and call routing to a roaming subscribers are provided.

Since communication among every component of GSM architecture is either through radiofrequency (air interface) or cable, antennas and cables are required to ensure effective communication among them. Therefore, in a base station there must be antennas usually hung on towers and masts. There is also a need for electricity to power the equipments in the base Station thus, the need for power generating set or other means of power generation. Air conditioning is also required to keep the equipments under a normal temperature.

Telecommunication installations

As defined earlier and from the explanation on the GSM architecture, it is deducible that telecommunication installations include:

1. Towers/Masts;
2. Antennas;
3. Cables;
4. BTS;
5. Power Generating Set/Backup battery;
6. Air conditioning.

Environmental challenges and impact of telecom installations

In the process of the telecom equipments and their operation some environmental challenges usually ensue. The major of the challenges are summarized below:

1. Alteration of the earth habitation;
2. Alteration of the aquatic habitation;
3. Obstruction and Alteration of vision;
4. Hazardous materials and waste;
5. Emission of electromagnetic fields;
6. Air pollution;
7. Noise pollution; and
8. Occupational health and safety.

It is to be mentioned here that through the above listed issues are challenges that are associated with the operation of telecommunication almost everywhere, there have been efforts by various governments through their agencies and commissions to promulgate laws and regulations to prevent, control and minimized the effect of these challenges on the environment. Because of inadequacy of time and space, the above listed challenges will be discussed from Nigeria point of view. However, references shall be made where necessary to some foreign regulations and practice in juxtaposition with Nigerian regulations and practice.

In Nigeria, there are many laws and regulations made there under which provide for the protection of the environment generally and specifically. These laws include:

1. Nigeria Communication Act, 2003
2. National Environmental Standard and Regulations Enforcement Agency (establishment) Act, 2007

⁷ John Scourias, 'Overview of the Global System for Mobile Communication, 1995.pdf

⁸ Ibid

3. Environmental Impact Assessment Act, 1992
4. Electrical Power Reform Act, 2005
5. Nigeria Airspace Management Agency (Establishment) Act, 1999
6. Nigeria civil aviation authority (establishment) act, 1999
7. Factories Act, 1987
8. Nuclear Safety and Radiation Protection Act, 1995

Alteration of the Earth and Aquatic Habitation

As explained earlier, the working of telecommunication requires the installation of certain equipments which include towers, masts, cables e.t.c. A location usually referred to as Base Station is needed for construction of tower or mast and the connection of the cable thereto. Also, depending on their location, the installation of fixed line components, including shore approaches for long distance fiber optic cables and access roads to transmission towers and other fix infrastructure, may require some constructions crossing aquatic habitats. In the process of doing this, the face of the earth or the aquatic habitation may be altered depending on the nature of the infrastructure that is being put in place. For instance, digging of land for lying of linear cable defaces the earth while mounting of tower in certain environment reduces its serenity. Lying of optic fiber cables across shores also has the potential to disrupt watercourses, wetlands and underwater vegetations. In the cause of construction of Base Station, access to public utility may also be temporarily denied.

Obstruction and Alteration of Vision

Another environmental challenge usually posed by telecom installations especially towers and masts is obstruction of vision or visual alteration. The important of towers and masts in the provision of quality service in telecom industries cannot be overemphasized. Towers houses antennas that receive and send signals and the closeness of these towers to each other no doubt ensures better quality of service.⁹ Without Base Station, call cannot be made and when Base Stations are too far from each other holes or breakages in coverage appears and calls are interrupted or dropped especially when the caller /subscriber is on the move¹⁰. The higher the tower upon which antenna is hung the better the receptive capacity of the antennal. Therefore, the need to roll out more towers to meet up with the growing number of subscribers will no doubt create proliferation of towers thus; impair the visibility of the environment. The obstruction of vision by towers and masts is more and properly appreciated when considering the air transportation sector and other creatures that fly in the air.

Hazardous Materials and Waste

Though the operation of telecommunication may not necessary require the use of hazardous materials, however, because of an adopted style or system of operation by each operator or the environment in which operator operate some Hazardous materials which are not primarily necessary in the operation of telecommunication may be used. For instance, the operation of certain types of switching and transmitting equipment in Base Stations may require the use of backup power systems to keep the Base Station powered and functional at all times. This power backup system may consist of a combination of batteries (typically lead-acid batteries) and diesel-fueled backup generator sets.

Operation and maintenance activities of Base Stations and other telecom facilities may also result in generation of electronic wastes like circuit boards from computer and other electronic equipments. The Operation and maintenance of backup generators and service vehicles may also result in the generation of used tires, and waste oils and used filters. Transformer equipment may potentially contain polychlorinated biphenyls (PCBs) while cooling equipment may contain refrigerant (potential ozone depleting substances {ODSs})¹¹.

⁹ Telecommunication, <http://www.worcester.gov.uk/index.php>ascessed> on 27/2/14

¹⁰ Ibid

¹¹ Environmental, Health, and safety Guidelines for Telecommunications, www.ifc.org/wpc/wcm/connect/telecommunication>accessed 27/2/2014

Emission of Electromagnetic Fields

There is no doubt that this issue is one of the most controversial areas in the telecommunication industries. This is due to the claims and counter-claims from experts that the emission of electromagnetic fields constitute health challenges and dangers as explained earlier, the Mobile Site (MS) or mobile handset communicates with the Base Station through radiofrequency signal. On the other hand, a base station communicates with another base station through microwave link. The handset has inbuilt antennas which sends signal transmission, or voice and data traffic to the radio frequency (RF) antenna mounted on the tower in a Base Station. The signal sent by the handset is processed by the Base Transceiver Station (BTS) which is usually housed in a prefabricated shelter located in the base station; and send the processed signal to other Base Station via a microwave antenna also mounted on the tower. The RF antennas are usually the long white objects mounted on the tower while the microwave antenna is the white drum-like object mounted on the tower.

In the process of this signal transmission, radiation is emitted in the electromagnetic field. Radiation is the energy that comes from a source and travels through space and may penetrate various materials¹². It may be ionizing and non-ionizing radiation¹³ also referred to as higher frequency radiation is generally considered to have harmful potentiality to human health when continuously exposed to for a very long time without adequate protection and or precaution. Non-ionizing radiation on the other hand is the extremely low frequency radiation which arguably, is considered to pose no significant harm to human health. Example of non-ionizing radiation is the one used in the telecommunication industries.

There is no gainsaying the fact that the issue of emission electromagnetic fields in the telecom industries being harmful to the environment has been a subject of controversy since the market explosion in the industries. There are claims that the radiation emitted to the atmosphere in the telecom industries causes series of health challenges ranging from cancer, hampering of memory and sleep patterns, brain tumors, infertility, anxiety, e.t.c.¹⁴.

The above claims (though not their veracity) are even acknowledged by the then executive vice chairman of NCC, Engr. Earnest Ndukwe when he says 'as evidenced by all the papers presented there are a myriad of health related concerns associated with EMF emissions from mobile telecommunications. There has been growing concern throughout the developed world that exposure to radiation from base stations and mobile handsets could lead to increased risk of illnesses such as cancer and may adversely affect cognitive functions like concentration and may cause memory loss, headaches, dizziness and epilepsy among other'¹⁵. Unfortunately, this belief or claim has been identified as a factor responsible for the attitudinal change in the operators' prospective and existing landlords and neighbors to now either resist or reject the requests to site mobile telecoms equipment /infrastructures in and around their premises¹⁶ which reverse was the case hitherto. The recent classification of electromagnetic fields (EMF) radiofrequency (RF) as possible cause of cancer to human beings by the international agency for research on cancer (IARC), in May 2011¹⁷ is surely lending credence to the concerns of people who believe radiation causes health risks.

Conversely, there are other claims to the effect that exposure to non-ionizing radiation emitted by telecom installations has no significant health hazard that warrants the fear exhibited by neighbors of base stations or other phone users. Their claim is premised on the WHO report that exposure level to radiation by living near Base Station is extreme low thus, poses no health risk¹⁸. Interestingly however, the WHO also

¹² What is radiation, <http://hps.org/publicinformation/ate/faqs/whatisradiation.html>>accessed on 27/2/2014.

¹³ Ionizing and Non-Ionizing Radiation, <http://www.epa.gov/radiation/understand>>accessed on 27/2/2014.

¹⁴ <http://www.mast-victims.org/index.php?content=news&action=view&type=country&id=129>>accessed on 27/2/2014.

¹⁵ A keynote Address delivered by Engr. Earnest Ndukwe, Executive Vice Chairman, Nigerian Communications Commission at the Workshop on Electromagnetic Compatibility Problems in Industrial and Commercial Installations/Equipment held at University of Lagos on June 27, 2005.

¹⁶ I.B Eneye (MPSN, MNISP), The Health, Safety & Environment Challenges of Mobile Telecommunication Infrastructural Deployment in Nigeria.

¹⁷ IARC Classifies Radiofrequency Electromagnetic Fields as possibly carcinogenic to humans, press Release NO 208, Media Centre-IARC press Release, <http://www.iarc.fr/en/media-centre/pr/2011/index.php>.

¹⁸ Telecommunications, <http://www.worcerter.gov.uk/index.php?id=1176>>accessed 27/2/2014

acknowledged that there is need for further research in the possibility of non-ionizing radiation posing any health risk.

Remarkably, it may be argued that since telecommunication is relatively, a recent development and any significant health hazard can only manifest over some relatively long period of time, one may need to take some precautionary measures to reduce exposure to radiation whether ionizing or non-ionizing, so that no damage would have been done by the time outcome of researches confirm hazardous nature of non-ionizing radiation.

Air and Noise Pollutions

Another area of environmental challenges in telecom industries are air and noise pollutions. It is needless to mention here that the emission of radiation into the air as already explained in the preceding paragraphs also constitutes air pollution. Also, as explained earlier in this paper that the location of Base Station in some places and or the erratic power supply in Nigeria requires the use of power generating set as power backup to power the telecom installations.

In the operation of the power generating set, fumes are released to the atmosphere and the set also makes unpleasant continuous noise thus, constituting both air and noise pollutions. Also, deployment of service vehicles and other equipments for the construction of telecom sites can also, result to air and noise pollutions.

Occupational health and safety

In the construction and maintenance of telecommunication sites, workers are exposed to certain occupational hazard. For instance, in the cause of assemblage and construction of towers and masts, workers are exposed to possible fall from tower because of its enormous height. They may also be exposed to electrical and fire accident, electromagnetic fields, eye injury from particles and other hazards. In summation, occupational health and safety issues in telecommunications project can be said to primarily include the following¹⁹:

- I. Electrical Safety
- ii. Electromagnetic fields (occupational)
- iii. Optical Fiber Safety
- iv. Elevated and Overhead Work
- V. Fall Protection
- vi. Confined Space Entry
- Vii. Motor Vehicle Safety

Laws and Practice in Relations to Telecom Installations

In order to prevent and or minimize the above identified environmental challenges posed by telecom installations, some laws and regulations are put in place and some agencies are empowered to make further regulations as the need arises. Some of these laws provide in general term for protection of the environment while some provide for the regulation of specific aspects of the telecom installations.

Provision of Law for General Protection of Environment

On general provision for the protection of environment, The National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, 2007 (NESREA) empowers the agency establishes hereunder to *'prohibit processes and used of equipment or technology that undermine environmental quality'*²⁰. Another example of environmental protection general provision is section 136 of the Nigerian Communication Act, 2003 which is produced hereunder for ease of reference:

(1) A licensee shall, in installing its network facilities, take all reasonable steps to ensure that the causes as little detriment and inconvenience, and does as little damage, as is practicable.

¹⁹Environmental Health and Safety Guidelines for Telecommunications, www.ifc.org/wpc/wcm/connect/telecommunication > accessed on 27/2/2014

²⁰ Section 8 (d) NESREA Act, 2007

The law also mandates the network operator to restore back the land through which it carried out its installations to the condition similar to the condition of the land before the installation²¹. Licenses are further admonished in carrying out their installations to take reasonable steps to²²:

- (a) Act in accordance with good engineering practice;
- (b) Protect the safety of a person and property;
- (c) Ensure that the activities interferes as little as practicable with-
 - (I) the operations of a public utility;
 - (ii) Public roads and paths;
 - (iii) The movement of traffic; and
 - (IV) The use of land;
- (d) Protect the environment

It is also provided that before any project which is likely to have effect on the environment is embarked upon the environmental impact assessment of such project must first be carried out²³.

Provision of Law on Specific Environmental Issues of Telecom Installations

On the construction of towers and masts and their possible alteration of the earth habitation, the NCC 'Guidelines on Technical Specifications for the Installation of Telecommunications Masts and Towers' 2009 'provides for measures to prevent environmental challenges in the cause of masts and tower construction. This guideline particularly in respect of sitting the location of telecommunication towers and masts provides that the objective should include minimizing their number, protecting and promoting public safety, and mitigating the adverse visual impacts on the community whilst promoting the provision of telecommunications service to the public²⁴.

As earlier pointed out, the importance of towers in the provision of quality service in the telecom industries cannot be overemphasized; however, their proliferation no doubt poses a lot of environmental challenges raging from distortion of the serenity of the environment and the adverse visual impacts. In an effort to minimize the proliferation of masts and towers, operators are mandated to design and construct their Base Station in such a way that it can accommodate at least three (3) other service providers on the same structure²⁵. This practice is technically referred to as co-location. It is worthy of mentioning here that though, the objective behind co-location is appreciable, experts have argued that the practice of co-location may also constitute some further environmental hazard²⁶. In a co-located Base Station the tower/mast must be reasonably high to accommodate more antennas, thus, the height of the tower constitute adverse visual impact especially for air navigation while the increase in number of antennas will increase the amount of the electromagnetic emissions/radiation which to some, is injurious to the health.

As regard the height of powers and masts and its possible environmental hazard, the law provides that the maximum height that may be approved for a telecommunication tower in Nigeria is 150 meters²⁷. Notwithstanding, a tower, more than 150meters in height, may be approved by the National Communication Commission if the commission is satisfied that the increased height of the tower²⁸:

- (1) Will not be detrimental to the public health, safety or general welfare.

²¹ Section 136 (2) of Nigerian Telecommunication Act, 2003

²² Ibid, Section 136 (3)

²³ Sections 2 of the Environmental Impact Assessment Act, 1992

²⁴ See: Chapter 1, S. 3 (1) of Guidelines on Technical Specifications for the Installation of Telecommunications Masts and Tower issued on 9th April, 2009.

²⁵ See: Chapter 5, S.9 (7) of Guidelines on Technical Specifications for the installation of telecommunication Masts and Towers issued on 9th April, 2009.

²⁶ A keynote Address delivered by Engr. Earnest Ndukwue, Executive Vice Chairman, Nigerian Communications Commission at the Workshop on Electromagnetic Compatibility Problems in Industrial and Commercial Installations/Equipment held at University of Lagos on June 27, 2005.

²⁷ See: Chapter 5, S.9 (1) (a) of Guidelines on Technical Specifications for the Installation Telecommunications Masts and Tower issued on 9th April, 2009.

²⁸ Ibid²⁸, Chapter 5, S. 9 (1) (b).

- (2) Will not have a substantial negative effect upon neighborhood.
- (3) Is in conformity with the intent and purpose of the planning of the area and the general plan of community.
- (4) Will not impair the obligation to comply with any other applicable laws or regulations.

Also on the erection of telecom masts and towers, section 7(1) (n) of Nigerian Civil Aviation Authority (Establishment) Act, 1999 empowers the authority to prohibit and regulate the installation of any structure which by its height or position is considered to endanger the safety of air navigation. The height and closeness of tower to the airport or helipads may constitute air navigation danger therefore, in order to prevent this possible air navigation hazard, a tower which height exceeds 30 meters must be approved by the National Air Management Agency (NAMA)²⁹. No masts or towers (irrespective of the height) may be installed within 15 kilometers of any airport without prior approval and a permit from the Nigeria Airspace Management Authority (NAMA)³⁰. As a measure to further prevent the air navigation related hazard, towers are required to be marked/painted in a particular colour and its top lighted in a particular way. This is to ensure that the obstruction to air navigation remains visible and the pilot is enabled to see any towering object at a range sufficient for him to take appropriate action in order to avoid the obstruction.

Other practices which are meant to eliminate or reduce the menace of the proliferation of towers are the Roof-Top/High Object Mounting and alternative mounting (camouflage). Network providers can make use of roof-top of high building or structure like skyscraper and power line towers respectively. The alternative mounting structure is the camouflage telecom tower which is usually in form of activities trees for the objective of the camouflage to be achieved and to avoid creation of visual uniqueness, the colour, scale and character of the camouflage tower to the adjoining structures must be similar³¹.

In order to reduce or prevent the exposure of neighbors of Base Station of radiation, a tower is to be constructed at least 5 meters³² or 10 meters³³ away from residential area. Apart from the fact that the dichotomy created by the NCC and NESREA in this regard gives room for excuses for non-compliance, it is doubtful, considering the proximity of some telecom towers to residential houses whether service providers are actually complying with this requirement.

Network providers in the construction of Base Station and its maintenance are to provide for their workers like every other factory workers protective clothing and appliances such as head helmet, protective jacket, fall-protection belt, gloves, goggles and other accident preventive apparatus in order to prevent occupational or workplace hazards³⁴.

On the issue of air and noise pollutions mostly generated by the power generating set which supplies backup electricity to the Base Station, it is provided that any company including network operators with any source or potential source of air³⁵ and noise³⁶ pollutions should take measure and develop plain to prevent and control such pollutions the NCC regulation that only sound proof and fumeless generator should be used by service providers.

CONCLUSION/RECOMMENDATION

There is no doubt that for the service providers to be able to provide quality of service in the telecom industries, there is need for urgent and continuous expansion of the telecom installations. However, the yearning quality of service by subscribers, the inevitability of more installations by network providers to meet this yearning and the adverse environmental consequences of more telecom installations create a

²⁹ Ibid, Chapter 3, S.7 (1) (a) (vi)

³⁰ Ibid, Chapter 3, S.7 (1) (a) (vi)

³¹ Ibid, Chapter 2, S.4 (3) (a)

³² Ibid, Chapter 5, S.9 (9) (c)

³³ National Environmental (Standards for Telecommunications/Broadcasting Facilities) Regulations, 2010, S.1.No.11

³⁴ Sections 47 and 48 of the Factories Act, 1987.

³⁵ Section 20, National Environmental (Food, Beverages and Tobacco Sector) Regulations, 2009 (S.133 of 2009)

³⁶ Ibid, Section 22.

kind of quandary of whether to satisfy the yearning of subscribers and create more environmental challenges or to protect the environment and provide poor quality of service.

The need for sustainable development i.e. striking balance between the economic expansion and the environmental protection especially in the telecom industries propelled the promulgation and legislation of some laws and guidelines. However, because of corruption and lack of awareness on the part of the general public, the laws, regulations and guidelines seem to be observed more in compliance. It is therefore recommended that:

1. All the stakeholders particularly the agencies and commissions who have direct and indirect role to play in the compliance with the environmental standard in the telecom industries should wake up to their responsibilities and get rid their system of corruption.
2. A comprehensive research should be jointly conducted by the stakeholders in the telecom industries on the long time effect of exposure to non-ionizing electromagnetic radiation.
3. While the research is on-going, precautionary measure should be devised and taken to reduce the exposure to even non-ionizing electromagnetic radiation.
4. Public awareness should be created to allay the fear of the public on claimed but unsubstantiated telecom installations health related risks and to warn the public on the possibility and potentiality of some telecom installations to pose health dangers.
5. The government should provide an enabling environment such as provision of constant power supply and a comprehensive electrification project to eradicate or minimize the use of power generating set.