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The American University in Cairo

School of Global Affairs and Public Policy

**COMPLIANCE OF CORPORATE BUSINESSES TO HEALTH AND
ENVIRONMENT STANDARDS
THE CASE OF CELL PHONE TOWERS IN EGYPT**

**A Thesis Submitted to the
Public Policy and Administration department.**

**In Partial Fulfillment of the Requirements for the Degree of
Master of Public Administration**

Submitted

by

Mohamed Mostafa Abdel Razek

**Under the Supervision of Khaled Abdelhalim, PhD
January, 2016**

DEDICATION

I am dedicating this research to Allah the Almighty for all, His numerous grants during my whole life. I also dedicate it to my parents and my wife for their encouragement to do this research and to my colleagues those who have supported me, especially in the hard times, to finish this research in such short time.

I would like also to deeply thank my supervisor Dr. Khaled Abdelhalim for his support, cooperation and for being responsive during the whole thesis work. I am also grateful for my readers Dr. Hamid Ali for his support and Dr. Ghada Barsoum for her precious feedback as readers for the thesis.

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List of acronyms

NTRA: National Telecommunications Regulatory Authority

PRE: Performance Review Institute Registrar

IRB: International Review Board

ISO: International Organization for Standardization.

EEAA: Environmental Affairs Agency

RF : Radio frequency

NTI: National Telecommunications and Information

ANSI: American National Standards Institute

WHO: World Health Organization

IEC: International Electro-technical Commission

IEEE: Institute of Electrical and Electronics Engineers

ICNIRP: International Commission on Non-Ionizing Radiation Protection

INT: institute national of telecommunication

ICTA: Information and Communication Technologies Authority

ABSTRACT

The American University in Cairo
School of Global Affairs and Public Policy
Department of Public Policy and Administration

COMPLIANCE OF COPORATE BUSINESSES TO HEALTH AND ENVIRONMENT STANDARDS

THE CASE OF CELL PHONE TOWERS IN EGYPT

Mohamed Mostafa A.Razek 800 12 1117

Supervisor: Dr. Khaled Abdelhalim

This study explores the compliance of corporate businesses to the health and environment standards especially, the construction of cell phone towers, in Egypt. Also, it examines to what extent the mobile companies in Egypt adhere to the health and environment standards, namely in the residential areas (informal and poor areas). It demonstrates how the standards set in Egypt are not applied restrictively enough to ban the violations. Besides, there are negative impacts that might be found as a result of not complying with the health standards. In this study, the qualitative research methods were used in the form of in-depth interviews with the three mobile companies (Vodafone, Mobinil, Etisalat) and the Egypt governmental body (NTRA). The research findings showed that mobile companies in Egypt do not comply with the health and environment standards in many cases. In terms of health and environment standards, the study, based on the interviews in addition to the literature review, showed that setting up cell phone tower stations on the buildings' roofs has negative impact in case of not complying with standards. Therefore, it could be considered as a source of danger, especially, to those who live close to towers. Also, the NTRA's standards are not strong enough to ban the violations compared to other countries (Turkey, Tunisia, and South Africa). Moreover, the study reveals some reasons behind the violations such as: delivering good coverage, people's attitude, building violations, and the most important reason is the weak role of the governmental body represented by the NTRA.

Chapter 1: Introduction

a. Background

In 2011, in one of the Egyptian villages called Bamha in Ayyat, Giza governorate, hundreds of residents set fire to the railway and blocked the railway movement in Giza for two days in order to protest against constructing a cell phone tower in their village which did not meet the standards. Such protest delayed about 200,000 passengers who were riding on 70 trains (Mena, 2011). The protestors believed that such tower emits waves, which have negative impact on their health and might eventually cause diseases. Accordingly, the governor of Giza, Ali Abdel Rahman, said that he made negotiations with MobiNil, the owner of the tower, in order to relocate the tower (ibid). This raises concerns whether such towers are considered as a source of danger in a way that forces hundreds of residents to take such action.

Cell phone and Wi-Fi services were launched in Egypt in 1998 in order to provide mobile phone services all over Egypt, which was represented by only two companies, Vodafone and Mobinil, before establishing the third company Etisalat. The Tripartite Protocol committee (Ministries of Communications, Health and Environment) was established in August 2000 in order to set health and environment standards (Ministry of Communications and IT, 2015). Over two years (from 1998 to 2000) many cell phone towers were constructed which might not comply with the health requirements. Moreover, at that period, there were not any regulatory bodies to control the construction of cell phone towers in residential areas, taking into consideration that electromagnetic pollution has become one of the major dangers in our age the "age of communications" (Rees, 2011).

On the national level, in 2000, the Egyptian government established an agency called NTRA (National Telecommunications Regulatory Authority) in order to regulate the telecommunications sector. Such agency has many duties such as, protecting the consumers' rights and setting up the health and environment standards that must be followed when constructing cell phone towers. It is also responsible for monitoring the situations of all the towers in Egypt, either by giving the mobile companies the license to set up a tower or by following up on whether the towers are installed and working according to the health standards (Egypt 2013: IT & Telecoms, 2013).

Although the main role of such agency (NTRA) in addition to the local government is to protect the citizens' health and their rights; however, the issue that is still debatable is the associated health risks due to constructing more cell phone towers in the residential areas given the harmful radiation which emits from it.

b-Problem statement, research questions and hypothesis

All over the world, there are many recent cases that show how people are confused about the negative impacts of direct exposure to the waves emitted from cell phone towers, particularly those close to houses and do not comply with the health and environment standards.

There is an Australian study which found that children who live next to a cell phone tower are vulnerable to get leukemia three times more than those who live over seven miles away. Moreover, some studies showed that the radiation which emitted from cell phone towers can damage cell tissues and DNA, causing miscarriage, suppressing immune function, as well as other health problems (Rowley, 2012).

Also, the cell phone towers' radiation can change the neurotransmitter functions, blood-brain barrier, morphology, electrophysiology, cellular metabolism, calcium efflux, as well as gene and protein expression in certain types of cells even at lower intensities (Sudarsanam, 2013). It can be inferred that, all over the world, there is a new scientific trend to define what the actual hazards of the towers' emission exactly are.

Despite the global knowledge of such hazards, the situation in Egypt is worst owing to that the mobile companies construct cell phone towers in the residential areas on the buildings' roofs. Furthermore, there is no clear vision about to what extent the mobile companies consider the health standards when constructing towers in such crowded areas. Accordingly, the main problem of this research is the health hazards that Egyptians are exposed to due to the radiations emitted from cell phone towers in residential areas. This problem is compounded by the lack of actual data regarding how many cell phone towers in Egypt and their distribution, as the literature review indicates. This main problem is compounded by the following problems:

- The Egyptian standards and monitoring processes that are applied for constructing cell phone towers in residential areas are not appropriate or strong enough to save the Egyptians' health. Obviously, on the ground, they do not seem to be applied anywhere.
- The regulatory body(NTRA) and executive body (local government) do not respond to the citizens' complaints in case of finding violated towers; what happened in Bamaha village is an evidence.

In addition, the governmental resource in Egypt did not tackle such issue in either their current activities and progress reports or the long-term planning reports. For example, according to the Egypt 2050 strategic planning report, the focus is mainly on the enhancement of the situation in

Egypt (particularly in Cairo governorate) to be one of the advanced country by the end of 2050 (Egypt T. g., 2007). Regarding to the environmental issue, the Egyptian vision 2050, does not pay attention to the health and environment standards that should be applied in many polluting industries, including the telecommunication sector. The vision targets the enhancement of the quality of life for the Egyptians, increase the green areas, maintain the non-renewable natural resources, but it ignores the enforcement of environmental and health standards that are supposed to protect the people's health in many fields, such as cement industries, ceramic industries, and the telecommunication sector (ibid).

The main hypothesis of this research is that the stated problem exists due to the lack of commitment by mobile phone companies to the standards in constructing the cell phone towers especially in the residential areas; consequently, the standards are not strong and appropriate enough to act as a mandatory policy that could stop the violations eventually.

Accordingly, the main research questions are; to what extend the mobile companies in Egypt are complying with the NTRA's standards? To what extend the Egyptian standards are appropriate to save the Egyptians' health compared to those of other countries? Moreover, discussing the reasons behind such violations made by the mobile companies, if any? What are the negative impacts for not complying with the health standards? Finally, what are the influencing factors that will oblige the companies adhere to the standards?

c. Importance of the research

Obviously, anything that is related to the people's health and the environment should be considered as an important and vital issue. Such an issue has become one of the most dialectic issues all over the world. Therefore, adhering to the health and environment standards has become one of the main concerns for many researches and scientists as well. For example, the

Germany's official radiation protection body advises its citizens to use landlines instead of mobile phones, and warns them of "electrosmog" which is available in a wide range of everyday products, such as baby monitors and electric blankets (Geoffrey, 2007). The researchers exerted plenty of effort and conducted many researches in order to study the impacts that might negatively affect people's health and the environment.

Therefore, many governments legislated restrictions and standards to control the business sector as well as industries that could negatively affect the environment, such as chemical industries and cement industries. In addition to these industries we have also the telecommunications sector that was recently accused by not adhering to the health standards, particularly, the construction of cell phone towers in the residential areas in Egypt which is the main concern in this study. However, there is not enough information related to this issue since constructing cell phone towers is considered a new topic, and adhering to the health standards is not considered as an important issue for many Egyptians. Accordingly, this study could participate in knowing exactly the reasons behind why the mobile companies do not adhere to the health standards in Egypt.

In more detail, while considering that constructing phone towers and Wi-Fi access point is a part of the telecommunications system development, some hazardous electromagnetic radiations were reported as a threat. The Tripartite Protocol (Ministries of Communications, Health and Environment Affairs) sets requirements for the construction of cell phone towers' sites in order to protect people from any danger as well as saving the environment. However, there are many number of citizens that expressed their fears about such issue and its potential negative impact.

Furthermore in the recent years, at the international level, the PRE (Performance Review Institute Registrar) has experienced an increase in requests for certification for environmental, health and safety standards. Since then, the business community has become more aware of their responsibilities to keep the environment clean and safe. Consequently, PRI responded by offering registrations to ISO 14001 and OHSAS 18001 standards as stated in the PRE website. Also, in Egypt, the government paid more attention for such issue, and it has some standards that are legislated by the Ministry of Environment. In terms of the telecommunications business, in 2003, the Egyptian government established a regulatory organization, (NTRA), in order to set standards for the telecommunication sector, including the three mobile companies: Mobinil, Vodafone, and Etisalat (Egypt A. R., 2015).

d-Scope and Purpose of the Research

This research mainly focuses on the process of the construction of cell phone towers in Egypt, especially in the residential areas and to what extent the mobile companies compel with the NTRA's standards. Moreover, the research demonstrates many points related to the negative impacts of cell phone towers and defines the main reasons behind the violations of the standards. Also, the research examines whether the mobile companies adhere to the health and environment standards when setting up cell phone towers in the residential areas or not. The wider scope of research is the factors affecting the adherence of economic activities to health and environmental standards, which the research results concerning cell phones towers can shed light on.

The nature of the research is exploratory because research conducted on this topic is very limited, and there is not enough information with this regard. Therefore, the technique that was used in this research in order to collect the data was a qualitative technique, depending in the

data collection process on in-depth interviews with all stakeholders including the three mobile companies, in addition to the NTRA, which represents the government supervision.

e- The Research Findings

The analysis shows that in many cases the mobiles companies in Egypt do not comply with the health and environment standards. They are always keen on keeping the violated towers as it is, because removing the towers or readjusting their position is costly. Also, the standards, that are applied in Egypt, are not restrictive compared to other countries such as Turkey, Tunisia, and South Africa. Moreover, there are many reasons behind the violations made by the mobiles companies, such as delivering good mobile network coverage, the weak role of the regulatory body (NTRA), and building violations, especially in slums and after 25th of January revolution.

Regarding the negative impacts on human health and the environment, not only the literature review but also the collected data shows that cell phone tower stations built on the buildings' roofs might be considered as a source of danger if it does not comply with the health and environment standards, especially to those who live close to them.

Chapter 2: Conceptual framework

In this research, there are many variables that are involved in such important issue which is the compliance of the mobile companies to the health and environment standards in Egypt; and to what extent these standards are restrictive enough in order to protect the citizens' health.

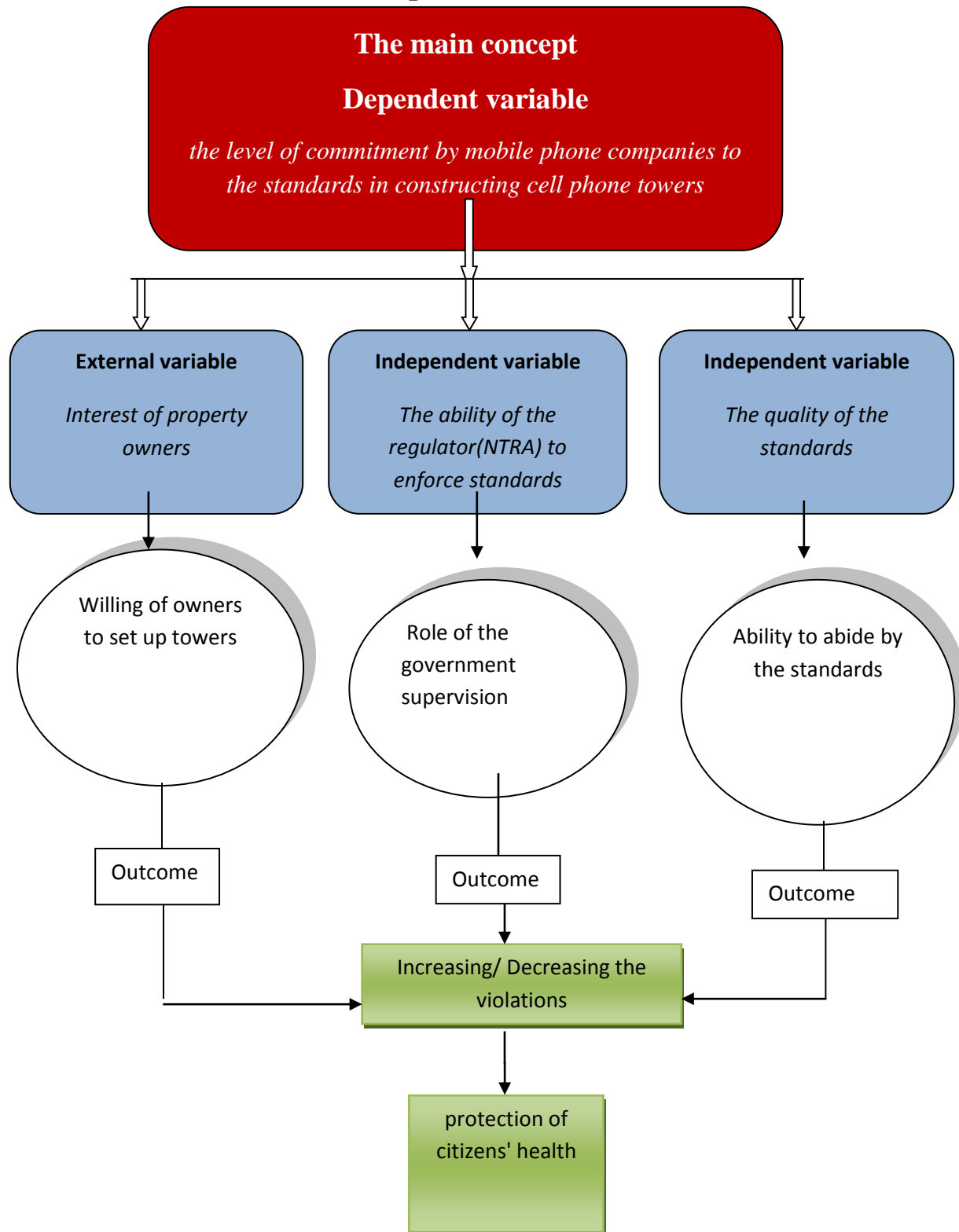
- First, in terms of policy and regulations, there are standards developed by the NTRA (National Telecommunication Regulatory Authority), which aims to protect the environment and public health.
- Second, the role of the NTRA in monitoring the construction of cell phone towers in the residential areas. Third, the backbone variable, which is represented by the three mobile companies in Egypt that deliver mobile's services.
- Finally, there are the citizens themselves; those who either benefit from such service or might suffer from the negative impact. The mobile companies must adhere to the standards in a way that they should be cooperative with the government in protecting the Egyptians' health. However, on the ground there are many violations in constructing cell phone towers especially in the informal areas and poor areas. Therefore, the main target of this research is to find out whether cell phone companies adhere to the environmental regulations of installing cell phone towers, why not and whether the standards are strict enough to control the violations.

a- The main concept and variables

The main concept in this thesis is the level of commitment by mobile phone companies to the standards in constructing cell phone towers especially in the residential areas. There are many reasons behind such violations. Furthermore, the hypotheses that are derived from the main concept is related to the role of the government (NTRA) as well as the nature of the applicable standards. Moreover, it is related to the citizens themselves about their awareness and how they deal with such issue.

The figure outlined below demonstrates the relations between the main concept (the level of commitment by mobile phone companies to the standards in constructing cell phone towers) and the different independent variables that affect it. For instance, the inappropriate standards could lead to failure of the companies to abide by them, hence heading to failure in protecting citizens' health. Moreover, the weak role of the regulatory body in Egypt (NTRA) could contribute to increasing the number of towers that not adhere to the health standards eventually. Also, buildings' owners by seeking their own financial interests help the mobile companies to do more violations regardless of the standards as well as the people's health.

The Conceptual Framework



Chapter 3: Literature review

a-Health and environment standards for industrial and technological activities

This section provides background knowledge about the standards that control and manage any business related to the health and environment either on the national or international level. The aim of this knowledge is to help in avoiding any potential factors that might negatively affect the health and environment. The health and environment standards in general are a set of documents that are required to ensure that the materials used to deliver a certain service (like our case cell phone towers) by any sort of business, are appropriate to the environment and has no negative impact on the public health (ISO, 2015). Therefore, the PRE (Performance Review Institute Registrar), which is responsible for all registrations in terms of environment and health, ensures that such materials are used in a safe way in order to save the people's health (Registrar, 2015). In addition, the PRE set many International Standards that are available either by the PRE itself or one of its members who are certified by the PRE for instance, ISO 14001 standards and OHSAS 18001 standards (as stated in the PRE website). Regarding, ISO 14001 standards, they are considered one of the most significant standards in helping different business corporations to use safe and clean materials in a way that protects the public health and environment from forming any potential negative impacts (ibid).

Morris (2004) stated that nowadays, the concern about health and environment is increasing. Therefore, setting such standards as ISO 14001 standards force the companies to set a specific environmental policy to define any negative effect that might be found as a result of such industry; also, to minimize such effect to be located in the normal range of safety (S.Morris, 2004).

Compliance to such environmental and health standards has many benefits not only to the people, but also to the business itself. For instance:

- Minimizing the use of raw materials can contribute directly to saving the environment as well as reducing waste of the rare resources.
 - The competitions between companies will arise as a result of minimizing the cost of materials that are used to produce products.
 - Helping the companies to respond to the accountability and responsibility.
 - Companies that are environmentally responsible will benefit from an improved public image. This can be useful for the company from a marketing perspective.
- (Registrar, 2015).

Giner (2004) mentioned that as seen, the world is more interested and is paying attention to such important and vital issues related to environment and health. Therefore, there are many standards that control and manage all products and services that might produce negative impacts. Accordingly, it is strongly recommended for companies to set a method to check the compliance to the standards, which should be clear and simple to be understandable (Giner, Environmental, 2004).

However, Susmita (1999) emphasized that the issue that is more important than the standards themselves is the compliance to such standards. In addition, it is too difficult for companies to do a sort of assessment monitoring in order to examine whether the company complies with the standards or not. In developing countries there are no appropriate tools as well as adequate funds to monitor the compliance to the standards, which consequently leads to a poor compliance to the standards (Dasgupta, 1999).

b- Global compliance to the health and environment standards

In 1999, in Mexico, there were many factories that paid attention to the environmental standards, while some did not comply with such standards. Also, they failed to realize the reasons behind that owing to the lack of periodic research and unavailability of data at that time (Dasgupta, 1999). Nowadays, Mexico is exerting great effort in order to protect the environment and health by creating the so-called Clean Industry Program which encourages industries to follow the standards (ibid). Such program has paid off by decreasing the number of violations and helped the government to do its job in terms of inspection and follow up in an easy and professional manner (Giner, Environmental, 2004).

Another example that demonstrates the importance of encouraging businesses to adhere to standards is the European Bank for Reconstruction and Development (EBRD), which played a very vital role in this issue when it provided about US\$28 million to one of the an independent Egyptian oil service company called Advanced Energy Systems SAE (ADES) Such amount was used to encourage and support oil producing companies to adhere to and apply the environmental, health and safety (EHS) standards in a professional manner (Zgheimb, 2015). Moreover, the target should be what is called "adequate enforcement." In some cases, it is more costly for some companies to comply with the standards rather than paying fine. Therefore, applying any standards should have reasonable cost in order to encourage compliance over violations (ibid).

Another example comes from Indonesia, where the Ministry of Environment established what is called the Program for Pollution Control, Evaluation and Rating (PROPER). This organization was responsible for evaluating the performance of the companies in terms of environmental

protection (Shakeb Afsah, 2013). The scale of performance was divided into five main colors. Gold refers to excellent and black refers to highly negative impact (ibid). This example proves that such environmental rating and information can succeed to work in developing countries.

c-Compliance to the health and environment standards in Egypt

In Egypt, there are many industries and factories that are considered as polluting industries, such as cement factories in Helwan and steel factories. Such polluting industries must be allocated outside the metropolitan region because these projects have severe negative impacts on the citizens' health as well as the environment. Consequently, the Egyptian government legitimized different laws in order to protect the environment and health; for example, law 4/1994 for the protection of the environment. Also, the Egyptian government restructured the Environmental Affairs Agency (EEAA) with the new mandates to be appropriate to save the environment. EEAA is now considered the main executive part of the Ministry (Source: Ministry of Environment).

However, Ahmed(2011) stated that, in 2011, November 15, in Damietta the people were confused and felt danger caused by building the MOPCO factory for chemicals and have demonstrated several times to ban building such factory, believing that the factory did not meet the standards for health and environment, and it is inappropriate to build such project close to the residential area (Osman, 2011).

Moreover, Amer (2013) mentioned that we have another industry that has many negative impact on health and environment which is the cement industry. Although this industry highly contributes to the national economy in Egypt, it has many dangerous gas emissions. Therefore, it must be controlled and adhered to the environment and health standards (Adel.M.Belal, 2013).

That means, there are many polluted industries in Egypt that still working regardless the people's health and the environment as well.

1-Telecommunications sector

There are still many controversial issues in Egypt regarding following the standards by many industries that could be harmful to the people. One of these issues is related to the telecommunication sector in Egypt and constructing cell phone towers in residential areas. In the telecommunication sector, the cell phone companies are following the standards or not, that is the question when it comes to cell phone towers and their impact on the public health.

The telecommunication sector in Egypt is regulated by the National Telecommunications Regulatory Authority (NTRA), which was established by the provision of Law No. 10, 2003 'the Telecommunications Regulation Law.' NTRA is the only national and independent authority agency that controls and manages the telecommunications sector in Egypt. The main aim of such agency is for protect the national security and ensuring that the telecommunications service reaches all areas in the country (Source: Ministry of Telecommunications).

Besides, NTRA cooperates with the National Telecommunications and Information (NTI) agency, the Ministry of Health and the Ministry of Environment in order to set health standards.

To sum up the role of the NTRA as a regulatory agency is:

Permitting the construction of cell phone towers in the residential areas. Saving the public health in line with the environmental and health standards. Making inspections on the towers and ban any sort of violation (ibid).

Yet, the issue of the health impact of cell phone towers remains a controversial issue given that there are opinions for and against the harmful impact of cell phone towers on people's health, as will be discussed in the following sections.

d-Supporting opinions: 'No negative impacts'

People's opinion on the impact of cell phone towers on human health can be categorized into two main categories.

The first category includes Supporters of the concept claiming that the cell phone towers have no negative impact. Moreover, they say that there is no need to be afraid from such towers as long as it complies to the health and environment standards. This group contains, the mobile companies themselves and government agencies (NTRA, Ministry of Health, and Ministry of Environment). This group emphasized that constructing cell phone towers in the residential areas in Egypt follows both the international and national standards. Also, there is no negative effect from such low RF (radio frequency) level radiation on the public health and environment.

On the other category, there are those who are against that opinion, considering this issue as unsafe, such as scientists, some citizens and part of the public opinion. In addition, they claim that it is considered a sort of hazard on the public health and against the human rights. Moreover, they argue that the mobile companies in Egypt do not follow the standards putting into consideration that standards are not strong enough to be a firewall for such violations that we have in Egypt especially, in the poor and informal areas.

First of all, we have to define the RF. According to Ilir (2011), the RF has to be defined. Radio Frequency fields (RF) is one form of radio waves and it is considered a form of electromagnetic

(EM) field, where, the data is transmitted as waves through space (Progri, 2011). In more details, when we make a mobile call, the mobile and the base station communicate with each others in a dual way by using the RF fields as a media to transmit and receive the data. In addition, sending and receiving messages and videos uses the same way (AusrraliaVodafone, 2014).

All over the world, most of the supporters see this issue from the view that the mobile companies are following the standards, so the danger will never arise. Therefore, in many countries we can find several examples that show that the electromagnetic waves have no negative impact on either health or environment.

For example, in 2009 the Norwegian Institute of Public Health, which was authorized by Ministry of Health and Care Services and the Ministry of Transport and Communications, made a report about the exposure to weak RF radiation has no negative impact.

Moreover, Michael (2013) showed an example from Norway and other countries similar to Norway, and claim that The experts committee reviewed many previous and recent studies regarding this issue (Olukolajo, 2013). Moreover, he mentioned that agree that the exposure to RF radiation does not have either direct or indirect negative effect on health; and does not cause any health problems such as cancer, heart, high blood pressure, the immune system or hormonal effects (ibid).

In Australia, the mobile companies have justified that mobile phone cannot work without base tower stations. Therefore, they keep constructing many towers in a way that improves their coverage and introduces new services such as video calling, internet and mobile TV (AusrraliaVodafone, 2014, p. 1). Moreover, people are willing to get more mobile phone coverage and accordingly, they respect the people's demands as well as their concerns regarding

any negative or harmful effects on public health. In addition, they demonstrated what the World Health Organization said concerning this issue:

“So far we don’t have a clear and scientific evidence that shows such weak RF signal which emitted from the cell phone towers has any negative impact on either health or environment

(Source: World Health Organization website).

In Egypt, we have the same situation, the mobile companies insist on convincing the people that the base stations’ transmission has no negative impact. In addition, the Telecommunications sector in Egypt claims that there is a strong independent organization (NTRA) that was established to protect people’s health and their rights. Furthermore, as stated at the NTRA website, constructing cell phone towers are following the international standards that are applied all over the world (Source: The NTRA website <http://www.ntra.gov.eg/>)

e-Opposing opinions: 'has negative impacts'

On the other side, there are many people opposing to such issue and consider it as a sort of a threat to the public’s health. Therefore, there are many groups from different countries including Egypt that are totally against the first group (supporters). From their point of view, they see that the electromagnetic radiations severely affect not only the people’s health but also the surrounding environment.

1-Hazards

In Saudi Arabia, Dr. Nahida (2012) leads an educational campaign about the hazards of technology on the mental and behavioral health. She illustrated in her campaign, an important research that was done at the Faculty of Medicine in Menoufia University in Egypt related to the

negative impact of the cell phone towers. This research proved that continuous exposure by nearby residents to radiation from the base stations has many negative impacts such as, negative behavioral balance and emergence of sleep problems (Farha, 2012). Also, the researcher stress that most of the studies on this side carried the results of frightening and very disturbing facts and pointing out that it is a global phenomenon. Moreover, she recommends that the mobile companies should adhere to the international standards for the radiation according to the released electrical engineers and American Electronics Association US National Institute for calibration. These standards state that the maximum energy density should not exceed 0.4 million W / square centimeter, and that the company provide a certificate to prove it(*ibid*). Unfortunately, the study did not mention the role or the NTRA's response towards this issue

In addition, Hoda (2014) mentioned that In one of the Egyptian village called Kafer Hakeem there was about 40 persons infected by blood clots and some patients died because of the direct exposure to the electromagnetic waves. Consequently, The vice president of the National Heart Institute recommended that : base stations should be moved out of residential areas. Also, he said that in many countries the governments quickly response to the people's demands in case of constructing a cell phone tower that not adhere to the standards while in Egypt the government do nothing regardless the people's health (Zakareya, 2014).

In Germany, Lean(2007) stated that the German government has encouraged people to avoid using Wi-Fi as much as they can to avoid such risks that might affect their health. Also, the Germany's official radiation protection body advised people to use landline rather than mobile phone (LEAN, 2007). Moreover, the Environment Ministry recommended that citizens should reduce their exposure to radiations from Wi-Fi as much as they can by using wired connections (*ibid*). According to Florian Emrich: Wi-Fi should be avoided "*because people receive exposures*

from many sources and because it is a new technology and all the research into its health effects has not yet been carried out." (Herried, 2007) Another scientist, Sir William Stewart, Britain's official health protection watchdog, who published two reports that advise people to reduce using cell phones as much as they can especially in schools. However, his request did not get any attention from the ministers council (LEAN, 2007).

There is an Australian study which found that children who live next to a cell phone tower are vulnerable to get leukemia three time more than who live over seven miles away. Moreover, some studies have showed that the radiation which emitted from cell phone towers can damage cell tissues and DNA, causing miscarriage, suppressing immune function, and causing other health problems (Rowley, 2012). Also, the cell phone towers' radiation can change neurotransmitter functions, blood-brain barrier, morphology, electrophysiology, cellular metabolism, calcium efflux, and gene and protein expression in certain types of cells even at lower intensities (Sudarsanam, 2013). It can be inferred that, all over the world, there is a new scientific response to define exactly what the actual hazards of the towers' emission are.

Girish (2010) stated the Indian mobile companies following the ICNIRP (International Commission on Non-Ionizing Radiation Protection) standards. However, in many cases the radiation goes above these standards, which were established by ICNIRP, leading to high probability of risk incurring to people living near to cell phone towers, especially older people, house wives and small children. Also, it can cause nervous diseases such as Alzheimer (Kumar, 2010). In addition, there are many bio-initiative reports that were prepared by a group of different scientists in 2007 which concluded that the existing standards for public safety are inadequate to protect public health.

In 2014, the department of Interior Charges in the USA declared that the FCC standards for cell phone radiation are outdated and no longer appropriate, making it unable to give adequate protection to wildlife and organisms (Ref: electromagnetic radiation safety, 2014). Also, the American Academy of Environmental Medicine (AAEM) that was founded in 1965 to study and treat the effects of the environment on human health mentioned that during the last 20 years, it was observed by physicians that electric power and many other electrical devices cause many symptoms (AAEM). In addition, there are many reports about diseases that might be found as a result of the exposure to the electromagnetic field and RF, such as cancer, neurological disease, reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity (ibid).

f-NTRA standards in Egypt

The standards were developed according to the safety standards taking into consideration the public health according to WHO, American National Standards Institute (ANSI), International Electro-technical Commission (IEC), International Commission on Non-ionizing Radiation Protection, and Institute of Electrical and Electronics Engineers (IEEE) NTRA stated that the phone towers are safe to human being as long as they comply with safety conditions. We have two categories of these standards: building standards and health and environment standards(Ref: NTRA website) The building standards defined many parameters that should be considered when constructing cell phone tower, such as:

- The height of the building which will has a tower
- The height of the cell phone tower itself
- The specification of the roof

- The distances between the tower and the surrounding buildings as well as the distance between two towers on the same building.

The health and environment standards also defined many parameters adhering international organizations, such as WHO, IEC, ANSI, and IEEE, such as:

- The distance between the tower and any human being
- The maximum permissible power density that emits from the tower
- The distance between the tower and hospitals and schools

The NTRA's standards are outlined (in details) in appendix C.

g- The telecommunications sector in Egypt, setting up cell phone towers

In Egypt, the same debate exists about the negative impact of cell phone towers; for instance, Akram (2010) said that the regulations that manage the construction of cell phone towers in Egypt are not considered as forceful as laws, they are just principles and standards (Farouk, 2010).

1-Shapes of the cell phone tower

It is important to define some parameters related to the issue of the research to make it understandable such as what is the cell phone tower station? It is a huge tower that carries more than one antenna to send and receive (calls, videos, messages, applications, etc.). These towers are set up either on land or on the top of buildings' roof (Bond, 2003). These towers have different shapes according to the nature of the signals and their location as shown below. The cell phone towers have main four shapes (Steel tower, concrete column, artificial towers (palms or trees), and towers on building's roofs) that differ based on the location of the tower and the areas that will be covered by these towers (Farouk, 2010).

The four shapes are shown below:

a- Metal tower:

This type of towers is used on land (if it has spaces available) or on the sides of main roads (for example the ring road). Although it is adequate to set up such towers on the sides of roads, this type is profusely used in the public and poor areas while in the high-income areas more beautiful types are used such as artificial palms and trees (as shown in appendix E, figure 1).

b- Concrete column

This type of towers is used on the sides of the main roads (ring road, Alex desert road, etc.)

(as shown in appendix E, figure 2).

c- Artificial towers (Palms, trees)

This type of towers is mainly used in free spaces specially in High-end neighborhoods (New Cairo, 6th of October city, and so forth) in order to maintain the nice look as well as reducing the visual pollution that might harm people in such areas (as shown in appendix E, figure 3).

d- Towers on the building's roof

This type is configured and constructed on the building's roofs, particularly in areas that have high building density such that it is too difficult to find a free space in order to set either steel tower or concrete ones (Farouk, 2010) (as shown in appendix E, figure 4). For that the mobile companies set up a small steel tower on the roof of the building with a height not less than 6 meters. This type of towers is the main concern in this research owing to that it is settled among people so it must adhere to the NTRA standards in order to avoid any potential negative impact for citizens in those areas.

The first version of the protocol, that manages and controls the construing cell phone towers process, was launched in August 2000 after three years from starting mobile service in Egypt. This means that there are many mobile towers which were constructed before the protocol, and did not necessarily comply with NTRA's standards. Taking into consideration that there are many negative effects of cell phone towers when placed on the top of the building as mentioned above(ibid). In other words, , the cell phones towers are considered as a source of danger if the safety standards are not followed.

Furthermore, in Egypt, cell phone companies adhere to the health and environment standards issued by NTRA in 2000. One of these standards states that the acceptable and safe limits of the radiation power density should be less than 0.4 MW/cm² (Ref: NTRA web site). However, the level of exposure varies based on the number of the phone calls all over the country. Accordingly, this means having more mobile phones will increase the power density of the towers stations (Abdel-Rassoul, 2007). The number of the cell phones roughly increased within two years from 1,575,000 (which represent about 2.5% of the Egyptian population) in the year 2000 to be about 7,000,000 (9.5% of the Egyptian population) in 2002 (ibid). This increase is continuing, with the hazard that the power density of the towers will definitely exceed the permissible limit.

Another negative effect is related to the public health aspect. Cell phones towers are considered a sort of danger particularly to people who either work in their construction process or who live close to it within distance less than 6 meters, as stated in the NTRA's standards which is too difficult to achieve that especially in the crowded areas. Therefore, the mobile companies should put signs to ban people from being too close to such dangerous area (Farouk, 2010)

We can conclude that the standards that are issued in Egypt in 2000 by NTRA became inappropriate to such rapid increase. As a result, the power density of the tower station will increase eventually in order to be able to cover the increasing demand for calls in a way that might increase the negative impact on the health and environment as well.

Moreover, according to an article published in 2012 about testing the compliance of mobile phone companies to the health and environment standards in many countries including Egypt, the study showed that the level of exposure to the RF in many countries are not within the normal range which was determined by ICENP (Rowley J. T., 2012). For instance, the international normal range is between 1 $\mu\text{W}/\text{cm}^2$ to 3 $\mu\text{W}/\text{cm}^2$ while in Egypt the average value of the level of exposure is 4.1 $\mu\text{W}/\text{cm}^2$ (ibid).

As seen from the results, the value of RF exposure in Egypt is considered high compared to the international normal range. Also, the article concluded that the people who are directly in front of the base station are more vulnerable to be in danger as a result of direct exposure to the RF emission from tower stations that do not comply with the safety levels of exposure. Accordingly, the health standards in such areas is strongly recommended to be evaluated (ibid).

Salwa (2010) stated that, unfortunately, the standards that control and regulate the cell phones station towers in Egypt are just a protocol that is not viewed as a law which is supposed to be enforced in order to prevent the mobile companies from conducting such violations. Furthermore, these towers are spreading all over Egypt and it is noteworthy that the number of stations in Cairo is more than 600 stations, where half of them were built before the issuance of the NTRA's standards (Azazy, 2010). We can infer that the weak role of the NTRA, as the representative body of government in this sector, and the lack of supervision on the towers,

negatively affect the violation of the standards, leading to potential negative impact on people's health, although protecting people's health and their rights is one of the NTRA's duties. Besides the weak role of the government especially in the telecommunications sector, corruption is another factor that can explain why the compliance to the standards in Egypt is not adequate. There is what is called illicit profit refers to the profit that people who violate the regulations or the standards get (CIPE, 2009)

The main target of NTRA is supposed to regulate, control, and protect people's rights by ensuring that the standards are firmly followed throughout the telecommunications sector in Egypt. However, the NTRA has been accused of many surveillance activities such as monitoring mobile, whatsapp, and facebook (KEY DEVELOPMENTS, 2013). That means NTRA distracted by these roles from focusing on monitoring compliance to standards. In addition, the weak role of the regulatory body, such as NTRA in Egypt, plays a very important role in making the citizens not trust the government as well as deviating away from its main duties (ibid).

Moreover, the people's profiting attitude and the ignorance of some property owners about the negative impact of setting up cell phone towers in the residential areas play a very vital role in that issue. Therefore, there are many arguments between the citizens and either the mobile companies or the owners of the buildings who allow the mobile companies to set up such towers on their building's roof regardless of the residents' rights and the potential negative impact. Also, the residents sent a complained complain to the NTRA, however, they did not get any response. As a result, the arguments eventually arise between the owner and the residents (Satar, The mobile phone and the electromagnetic pollution, 2002).

The main aim of many buildings' owners is getting money from the mobile companies as an annual rent against permission to the mobile companies to set a tower on the top of their buildings. The mobile companies try several times with the owner by money not caring about residents' complaints or their health. It can be inferred that the weak role of the NTRA in addition to not applying any sort of fines or punishments on the violator company encourage the mobile companies to do more violations (ibid).

Many cases of violations are reported especially in Cairo. For example, in the area of Sheraton Nozha neighborhood, one of the mobile companies paid a large amount of money to the owners' association of a building in order to set up a mobile station (Azazy, 2010). In response to such action, the representatives of the neighborhood's residents presented a complaint to the head of the district in order to make an inspection on that mobile station (ibid).

Another example in the Eighth District, housing of the cooperatives, Nasr City, a station was set up on the top of a building which is few meters away from a nursery. The mobile phone company paid about 24 thousand Egyptian pounds to the inhabitants of the property (Azazy, 2010). Accordingly, the owner of the building allowed the company to set up that station regardless of the complaints of the people who are living next to the base station tower and the antenna is directed towards the nursery (ibid).

h-The regulatory bodies in Tunisia, Turkey, South Africa

This section demonstrates various regulatory bodies in three countries are comparable to Egypt.

Also, it discusses the main role of those organizations in protecting people's health.

In Tunisia, there is what is called INT (Institute of National Telecommunications); it is the regulatory body which is responsible for issuing the health standards according to the law no

832, 2001. Actually, the role of this agency is focusing on how to protect people from any potential danger as stated in many articles implicitly inside the law.

For instance, in

- Article 2: Assigning appropriate free spaces around the cell phone towers, which are called protection areas in order to protect the people and enhance the radio network.
- Article 4: The operator must build the least number of towers as much as possible and must also reduce the power emission from the station.

Article 8: Constructing towers on privately-owned lands must be either unoccupied or common between many owners. In addition, public areas should be used to build tower stations rather than using private lands (Source: the Institute national of Telecommunications - INT website <http://www.intt.tn/ar/index-les-decrets-263-356.html>).

In Turkey, there are what is called ICTA (Information and Communications Technologies Authority) which legislates some standards in order to protect citizens' rights and ensure their health's safety, such as:

- Article 6: The safety distance between the tower and any human subject is calculated according to a certain equation (because each area is different than the others and has different situations) as shown below:

$$D = \sqrt{30} \cdot P \cdot 10^{G/10} \div E(\text{meter})$$

In this formula:

P: The output power of the device (Watt).

G: The antenna gain (dBi).

E: The limit value of the electrical field (volt/meter).

D: The safety distance (meter) (ICTA, 2015).

Since each district has different characteristics in terms of the density of populations and buildings, the safety distance is defined according a certain equation that has many variables, such as the out power of the antenna and it is gain.

- Article 5: The operator who violates or builds a tower station that does not adhere to the safety standards, will be given only 10 working days to modify such illegal action otherwise moving to article 23.
- Article 23: The operation of this (the violating) station will be stopped by the official governor. Moreover, the operator will pay a fine of about 50 times of registration fees as stated in the wireless tariff (Source: The ICTA website <https://www.btk.gov.tr/en-US/Ordinances>).

In South Africa, the city of Cape Town legislated a new policy in April 2015 in order not only to improve the visual image, but also to protect citizens' health. In terms of visual impact, articles 3 and 4 of the policy, stated that all antennas should be set in a way that do not affect the visual view especially in the locations that are considered as heritage areas. Therefore, it is recommended to set antennas on already existing buildings such as light masts and billboards and tall structures in order to ensure that there are not any distractions of the visual views.

Also, the Cap Town municipality strongly recommended sharing existing towers among many operators in order to minimize the number of towers which will consequently minimize any potential negative impacts. In terms of protecting the citizens' health in the city, article 10 stated that the citizens' safety is the only concern of the city; therefore, the mobile tower antenna should be in a zone that is far away from existing buildings with a distance of about 50 meter as shown in the figure.

Also, it is forbidden to build any buildings in that protection area in order not to harm the people's health

(Source: The city of Cape Town website <https://www.capetown.gov.za/en/Pages/default.aspx>).

i-Summarizing the literature review

The standards that are issued by the NTRA are not powerful enough or it is not considered as a law to prevent any violations; moreover, they do not force the mobile companies to adhere to them. Also, the weak role and the lack of supervision of the government represented by the NTRA have negative effects on that issue (citizens' health). In terms of health, many conducted research showed that mobile companies do not comply to the health and environment standards which has negative impacts on people's health, and can cause many diseases. However, the exact health impact is still so far a debatable issue. Finally, in comparison with the standards of other countries comparable to Egypt (Turkey, South Africa, and Tunisia), it is found that the standards that are issued by NTRA are not appropriate and strict enough to protect people's rights and health. Also, there is no respect to the visual image of the mobiles' towers or their distance to the surrounding buildings is inadequate, unlike the situation in South Africa and Tunisia where they Assign appropriate free spaces around the cell phone towers, which are called protection areas in order to protect the people and enhance the radio network. Also, construct the tower far any buildings with a distance at least 50 meter. Moreover, there is no action that is taken by the Egyptian regulatory body (NTRA) in order to stop the operation of any violated tower station unlike Turkey, where they stopped any violated stations by the official governor as well as the operator will be forced to pay a huge fine of about 50 times of registration fees as stated in the wireless tariff.

Chapter 4: Methodology

Mainly, the research focuses on to what extent the mobile companies adhere to the health and environmental regulations when installing cell phone towers and are these standards effective enough? Nowadays, there are observable violations from the mobile companies especially in the residential areas. Therefore, collecting data about such issue requires taking into consideration the diverse sources of data and the need to use appropriate methods of data collection.

In the research issue, the involved parties or the stakeholders are the three mobile companies in Egypt; Mobinil, Vodafone, and Etisalat as well as NTRA, which is the only regulator authority in Egypt that controls the telecommunications sector and permits the license of construction of cell phone towers in the residential areas.

Since the qualitative technique is relied on for investigating the different meanings of individual experiences; it deals with issues that are open ended and the type of the data that is descriptive. Also, in such technique, the form of data is either in verbal accounts form or descriptions form (how and why) or it formulates the observations into words (Timulak, 2005). Therefore, The researcher used this technique in the thesis for data collection because it is more flexible in a way that measures the reasons behind behavior such as how and why (ibid) and allows exploring many topics in more details and in depth. Accordingly, The investigator used in-depth interviews in this research and it was helpful, effective and appropriate than any other method because they allowed in-depth investigation of causal aspects of the phenomenon and compare results coming from all stakeholders..

a-Data collection through interviews

As mentioned above, there are two groups of stakeholders who are involved in that issue; mobile companies (Mobinil, Vodafone, and Etisalat) and NTRA (National telecommunication regulatory authority). In other words, it is like the two legs of the telecommunications body in Egypt: the service providers and regulator. Therefore, I am planning to conduct about eight inductive semi-structured interviews (one hour per interview) with Mobile companies and NTRA organization.

The main target of these interviews is to examine to what extent the mobile companies adhere to the NTRA's standards and whether such standards are strict enough to achieve health and environmental protection. Moreover, the interviews investigate why the mobile companies are accused of doing violations and what are the reasons behind them. Finally, to show the negative impact for constructing cell phone towers in the residential areas. Six inductive semi-structured interviews will be conducted with the three mobile companies' engineers, those who are in charge of construction cell phone tower in the company, two interviews for each company. The interviews questions give a full perception about the issue of investigation answer the main research question about whether the companies adhere to environmental and health standards and are these standards strict enough or not. The **Interview's field's questions** are available in appendix D

On the other side, conducting interviews with NTRA, which is the only authorized governmental organization in which regulate and keep an eye on communication service across the country. The mobile companies' opinion will serve their interest and might deny the hazard of electromagnetic radiation and claim that constructing cell phone towers in Egypt is following the health standards. Also, they are always trying to regain the people's trust and justify

constructing many towers to deliver an appropriate network coverage to their customers. To get the counter argument, also, two inductive semi-structured interviews will be conducted with two managers, those who are in charge of inspection the adherence to the NTRA's standards, at NTRA organization to complete the picture. Furthermore, it plays the inspector role in that issue. The interviews tackled the question what is the main role played by NTRA in controlling and permitting the license for the mobile towers as well as what were the actions that are taken towards any violations. In addition, demonstrated what is the power and mandates of NTRA in dealing with the violators companies according to environmental and health standards. The **Interview's field's questions are** available in appendix E

b-Hypotheses

The main hypothesis in this thesis is the lack of commitment by mobile phone companies to the standards in constructing cell phone towers especially in the residential areas. There are many reasons behind such violations. Furthermore, the hypotheses that are derived from the main one is related to the role of the government (NTRA) as well as the nature of the applicable standards. Moreover, it is related to the citizens themselves about their awareness and how they deal with such issue. In more details these hypotheses are:

- First, the first hypothesis is the weak role of the government regulatory body NTRA. The standards that are issued by it seem to be not strict enough in a way that makes them useless and ineffective to protect citizen's right and their health. In addition, there is no sufficient inspection to counteract the strong commitment towards constructing towers specially in the residential areas, and to test if the companies follow the standards or not. Also, the standards themselves are not considered as a binding law that forces the companies to follow it.

- Second, the Egyptians themselves are not aware of the negative impact and the consequence of violating the standards on the health and the environment as well. Obviously, it is mainly the most important concern about the cash benefit that might be one of the most interests for them, especially in the poor districts. Therefore, the mobile companies mainly focus on such weak point that helps them to tempt the property owners by paying a lot of money in order to set towers in the residential areas.
- Third, the lack of the governmental supervision of the construction of such towers is considered one of the main reasons behind such violations. In other words, the government doesn't have a committee in each district that makes the right decision according to each residential building concerning approval or rejection of installing a cell phone tower. Also, such deficiency can be embodied in that the government do not assign an appropriate public areas (that belong to the government) in order to be used by mobile companies for constructing cell phone towers in such poor areas. This lack make the mobile companies manipulate the standards and doing what is more beneficial for them regardless of the negative impact that might affect people's health (Farouk, 2010).

That means such hypotheses might play a very vital role that explains the failure of abiding by the health and environmental standards in setting up mobile towers in residential areas and the increase of the negative impacts. Also, they show how the role of the government is useless in protecting the public health for the Egyptians.

c-Ethical Considerations:

According to the AUC rules as well as International Review Board (IRB), all data concerning conducting interviews (the concept, methodology, questionnaire, and consent form) was sent to the IRB in order to get the approval to be able to start the data collection process. This approval is essential to ensure that that the data collection is conducted according to the ethical guidelines, which is available in appendix A

d- Research limitations:

Obtaining data from a governmental organization like (NTRA) for the purpose of this research will be challenging. Conducting interview with the NTRA will require many official approvals from either the AUC or NTRA in order to permit conducting the interview, it will took about one month to get a permission for interviewing. Also, the answers of the questions could be too short and incomplete; some questions might not be answered for unknown and unjustifiable reasons.

Moreover, in terms of public administration and public policy, literature on this issue, discussions about adherence to the health and environment standards, is too little, such that there is no enough knowledge related to it. Also, we can infer from the literature review that only few articles that demonstrate the issue from a critical perspective. Furthermore, most of these researches tackle the issue from either medical perception, for example Abdel-Rassoul, 2007 and Kumar, 2010, or engineering perception such as Farouk 2010.

Finally, this research covers the telecommunication sector in terms of complying with the health and environment standards and not the other business sectors or industries that also have problems as well as having negative impacts similar to the telecommunications sector.

Chapter 5: Data analysis and findings

In this part, the researcher will demonstrate the analysis of the collected data according to the interviews with the three mobile companies as well as the NTRA. First, the actual procedures followed by the mobile companies when setting up a cell phone tower at a top of a building will be explained. These procedures are almost common in the three companies except for few details. Therefore, a summary of the main points for each company is presented to set a general one.

The main research findings

1-The procedures that are taken in order to construct a cell phone tower

In order to construct a cell phone tower station, the mobile company needs to take certain procedures that must be considered by the mobile company and NTRA.

First, the company must do some technical investigations to determine the optimal location for each tower station. Then, the company has to get some approvals and permissions from the municipality in order to build such a tower. According to one of the mobile companies engineers:

"for example the company aims to construct a 12 meters tower in a certain area as a result a complaint about lack of coverage there or the capacity of the existing one no longer affords any extra lines. Therefore, there is a strong need to intervene to solve such a problem."

Another mobile company's engineer said that:

"First of all, the Radio planner, which belongs to the company, defined the best location in order to construct a tower that will produce a good coverage in response to people's demands."

Then the company sends a consultant (civil engineering consultant) to check whether the foundation of the building will bear such tower or not. If not it can reduce the height of the tower or change the whole location in order to achieve the safety factors for the people and the service

as well. Also, check the building license which is important to know if the building has been built legally or not.

After investigating and selecting the optimal location as well as checking the building license, the whole process move to the Acquisition Department at the company which is responsible for dealing with the owner of the building. The building can be owned by people; i.e. a private property, or under the control of the municipality (if it is built on public land or a building that was assigned to a public project). One of the engineers said that:

“it is mandatory to get a permission from the military and airport if the tower is close to a military building or to the campus of Cairo airports”

The mobile companies in Egypt do not have a civil engineering department in order to set up their own cell phone tower stations. Instead, the company mainly relies on passing the whole operation to a contractor (outsourcing) to build the tower according to the NTRA standards.

The last step in these procedures is sending a request to the NTRA in order to get the final license to run the tower station. Accordingly, the NTRA sends a professional team to the location of the tower to check whether the tower station was built according to its standards or not. If it is, the NTRA sends an official written permission to the company that contains all the information regarding this tower station.

The NTRA technical manager said that:

“the official letter mentions that the tower station is ok and it can run immediately”

Also, he mentioned that In case of finding the tower station not in compliance with the health and environment standards, The NTRA informs the company either, verbally or via official email that it needs to readjust the situation of the tower station in order to be compliant with the standards. That means the NTRA uses the official channel only if the tower adhere to the

standards while if the tower does not, they do not sent any official letter. Therefore, this ambiguous situation drives us to ask an important question about why they sent official letter in case of adhering while they do not sent any official paper in case of violations.

One of the most vital steps in such procedure is renting the building's roof from the owner. This step is essential and is considered one of the most important concerns particularly in poor areas. In addition, the physical location of the building is very important, in other words, the most optimal location will defiantly produce the best service coverage. For instance, the appropriate location of a certain building among all buildings in the surrounding area, may force the company to pay whatever amount requested by the owner. To sum up, the amount paid to the owner might increase more than the normal range depending on the building's location that will produce the best coverage.

According to one of the mobile companies engineer:

“For example, Embaba is a very vital area because it has a high capacity which needs more towers to deliver a good coverage. Consequently, the amount that will be paid might be more than that paid in similar poor areas.”

This situation is called a business case which means the company decides what it will pay according to the importance of the location.

In line with this concept, another mobile company's engineer said that:

“the paid rent varies from one area to another, the company pays a lot of money in a specific district while it pays less in the poorer and informal areas. For example, in a district like Faisl or Alharam, the paid amount is about 15000 to 20000 LE yearly while in the High-end neighborhoods it might reach to 100000 LE yearly.”

To support this issue the third mobile company engineer said that:

“For instance what have been paid to an owner in El Zamalek district is much, much higher than what have been paid in Faseil”

Moreover, the common aspect that was mentioned by the three companies is that the amount paid is different according to the district as well as the location of the tower. In the high-end neighborhood the amount paid for renting the building's roof is much higher than the poor areas referring to what the mobiles' companies engineers said:

“In the high- end neighborhood, money is not an issue”

That fits with the literature as Mohamed (2010) stated that the one of the mobiles phone companies paid about 24 thousand pounds in Shobra while other companies paid a large sum for the owners in El Nozha. This means in the high-end neighborhoods the amount paid should be high enough in order to persuade the building's owner in such areas. Finally, this issue (renting building's roofs by mobile companies) is considered as the main source of trouble in many cases. Therefore, it became one of the reasons behind the violations, which will discussed later in the "reasons behind violations part".

After illustrating the steps that are taken when setting up a cell phone tower on a certain building's roof, this part mainly aims to examine to what extent the mobile companies adhere to health and environment standards based on the data that was collected through the interviews. Qualitative analysis will be used in order to examine the data in order to fill the gaps in the study by answering the main research questions.

The research questions are:

- 1- To what extend mobile companies in Egypt are complying with the NTRA's standards?
- 2-To what extend the standards applied in Egypt are appropriate to protect people's health compared to the other countries?

3-Why do mobile companies make violations, if any?

4-What are the negative impacts for not complying with the health standards?

5- What are the possible influencing factors that could oblige the companies to adhere to the standards?

2-Perceptions about adherence to the health and environment standards in Egypt.

To what extend mobile companies in Egypt are complying with the NTRA's standards?

According to the collected data, the three mobile companies in Egypt do not comply with the health and environment standards. In addition, the companies are always keen on keeping the violated towers as it is as much as they can because removing towers or readjusting their positions is costly in a way that will lead to more violations.

According to one of the mobile companies' engineer:

“in some situations the company does nothing because the tower is settled and bring revenues to the company, therefore, it is too difficult to remove it.”

Moreover, another company's engineer said that:

“for example, according to the NTRA standards the distance between two towers on the same building must not be less than 12 meters. However, in reality, this does not happen in 70 percent of the cases.”

The statements mentioned above fit with the literature, as Farouk (2010) stated that, the standards and regulations that govern the mobile towers' distribution is not considered as a mandatory law.

Also, this fits with the literature as Rowley (2012) stated that the people who are near to the base station are more vulnerable to be harmed as a result of the exposure to the tower station's

emission that does not comply to the safety levels of exposure. Accordingly, the exposure to such areas needs to be re-considered and evaluated. We can infer that not adhering to the standards can have severe impacts on those who live next to violated towers.

Finally, that drives us to say that the role of the NTRA, as a regulatory agency, is too weak. Also, the standards in Egypt are not strict enough in way that makes the mobile companies comply with the standards issued by the NTRA. Accordingly, in the second question the investigator will discuss the strengths of the applied standards in Egypt.

3-The Egyptian health standards compared to other middle income countries

Q2-To what extend the standards applied in Egypt are appropriate to protect people's health compared to the other countries?

The telecommunications sector in Egypt, including the mobile services, is regulated and controlled by the NTRA. One of the NTRA duties is managing and permitting the construction of cell phone tower stations on the building's roofs, especially in the residential areas. Therefore, NTRA has issued 12 standards that must be followed by any mobile company that aims to build a tower station on a certain building's roof, such as

- The height of the building which will has a tower should range from minimum 15 meters to maximum 50 meters from ground,
- The distances between the tower and the surrounding buildings within 10-meter-radius circle as well as the distance between two towers on the same building must not be less than 12 meters.
- The distance between the antenna and human beings must be not less than 6 meters in the direction of the main beam and The maximum permissible power density a human being can be safely exposed to must not exceed 0.4 mW/cm².

- The distance between the antennas' main beam and the playgrounds of children's schools should not be less than 20 meters

The three mobile's engineers in addition to the NTRA's technical manager claim that Egypt has its own standards and we follow these standards that are issued by the NTRA and these standards are considered more appropriate than those of other countries. However, according to the literature review, we have many countries all over the world, (especially in Africa) that have regulatory bodies which issue more appropriate and restrictive standards. Also, the regulatory bodies these countries have control and manage the telecommunications sector in a firm manner as they have the mandate to apply fines and enforce standards.

In Tunisia, as mentioned in the literature review, INT the regulatory body responsible for issuing the health standards focuses on how to protect people's health from any potential danger as stated in many articles in the law. In more details, article 2 stated that (Assigning appropriate free spaces (called protection areas) will not only protect citizens and their health, but also enhance the radio network. Also, in article 4, the operator must build the least number of towers as much as in order to reduce the power emission from the station. Moreover, in article 8, the towers must be constructed on an owned land, that is either unoccupied or common and in preferably public areas (Source: the Institute National of Telecommunications: INT website <http://www.intt.tn/ar/index-les-decrets-263-356.html>).

In Egypt, taking into consideration the NTRA's 12 standards, we do not have such regulations or obligations like Tunisia, which are very vital in a way to protect people in case of the fall of the tower for example. Nowadays, we can see the wide spread of the towers everywhere in Egypt without considering or paying attention to the safety factor, unlike what is applied in Tunisia

(by assigning free spaces), in case of fall of the tower, which might be a disaster specially in informal and poor areas. Also, it is essential to force companies to set up the towers on land rather than on the buildings' roofs if possible.

Another example from Turkey that could be applied in Egypt is the legislative body that set standards in order to protect citizens' rights and health. According to the law of the telecommunications sector in Turkey, in article 6, the safety distance between the tower and any human subject is calculated according to a certain equation because each area differs than the others and has different circumstances, as explained in the literature review.

In addition, each antenna has different values of output power, and accordingly, fixed safety distance is inappropriate (like in Egypt in article 4 which stated that: the distance is fixed by six meters). For that, it is mandatory to define a safety distance according to these different variables in order to protect residents from dangerous antennas' emission. Moreover, in article 5: the operator who violates or builds a tower station that does not adhere to the safety standards will be given only ten working days to modify it otherwise, moving to article 23, the operation of this station will be stopped by the governor besides paying a fine about 50 times of registration fees as stated in wireless tariff (Source: the ICTA website <https://www.btk.gov.tr/en-US/Laws>).

In Egypt, there is a fixed distance between the antenna and the human subject (six meters) according to the NTRA's standard No. eight "*When the antennas are mounted, the horizontal distance between them and human beings must be not less than six meters in the direction of the main beam.*" That means that we have one fixed distance for all different antennas which have

different outputs in a way that might have negative impacts on people's health especially with antennas which have high output powers.

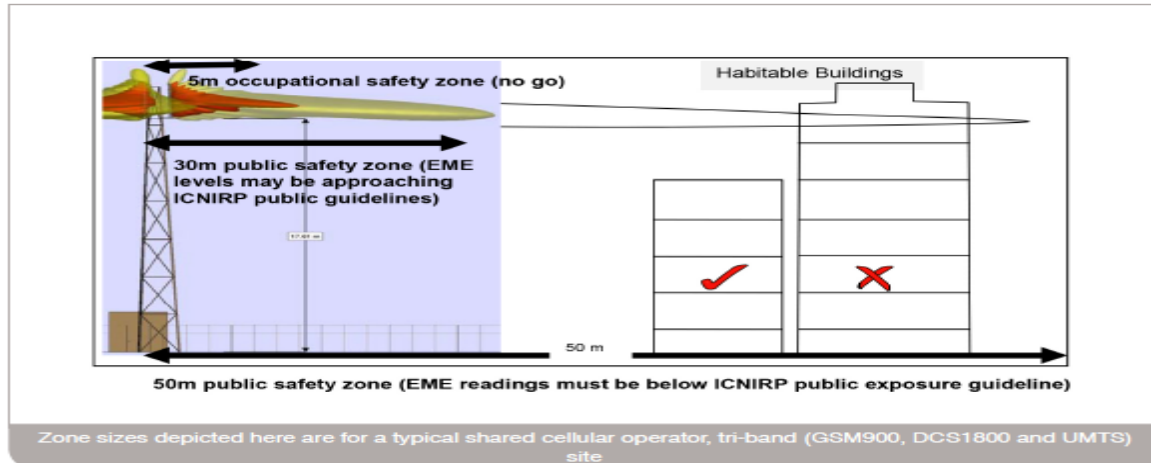
Also, regarding any violations, there is no action that is taken by the NTRA in order to stop the operation of any violating tower station. NTRA has no executive power in a way that makes it a weak regulatory body which does not have enough power to neither stop the operation of towers nor to impose a fine like what is applied in Turkey.

According to one of the mobiles company's engineer:

“NTRA has no Executive authority to remove the violated towers”

In another example from South Africa, especially in Cape Town, the city of Cape Town legislated a new policy in April 2015 in order not only to save the visual view especially in heritage sites, but also to protect the citizens' health. Therefore, it is recommended to set the antenna on building that already exist such as light masts billboards and existing tall structures in order to ensure that there is not any distractions of the visual views as shown in appendix E, figure 5)

Also, the Cap Town municipality strongly recommends sharing any existing tower between many operators in order to minimize the number of towers which consequently will minimize any potential negative impacts. In terms of protecting the citizens' health, the city stated mobile tower antenna should be in a zone that is far away of any existing buildings with a distance about 50 meters A shown in the below figure.



(Source: The city of Cape Town website

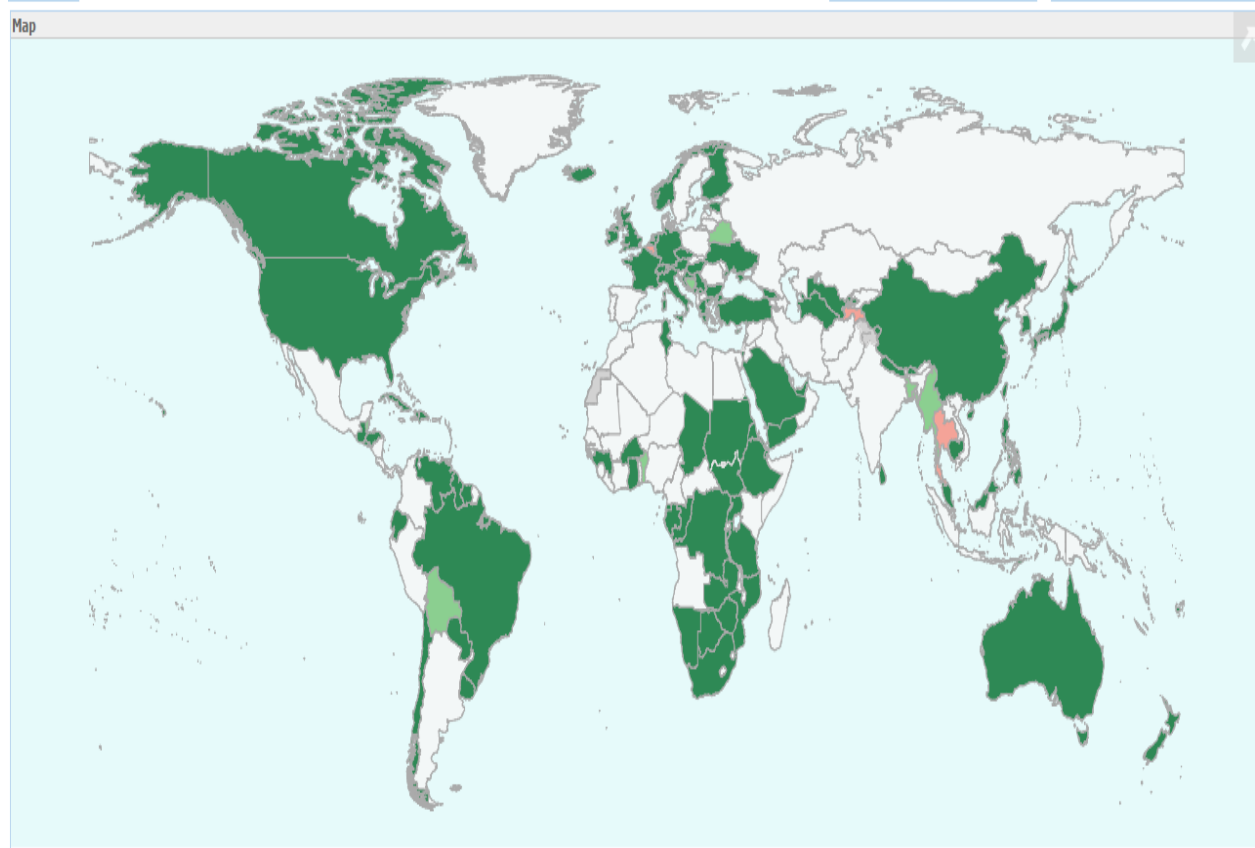
<https://www.capetown.gov.za/en/Pages/Results.aspx?k=TELECOMMUNICATION%20INFRASTRUCTURE%20POLICY>)

In Egypt, there is no respect to people's health or to the visual views, compared to South Africa, except in high-income areas. In many areas especially informal and poor areas there is a destructive view as a result of building many tower stations on the top of the buildings. However, in the high-end neighborhood, the tower stations take the form of artificial palms in order to maintain the aesthetic appeal (As shown in appendix E, figure 6 and 7).

Also, in Egypt according to the NTRA's standard two "*The height of the Macro cell antennas must be more than that of the surrounding buildings within ten-meter-radius circle.*" While the Egyptian standards require only ten meters between the tower and any surrounding building, it is about 50 meters safety distance in South Africa.

The below figure shows a WHO global survey for countries that have national standards of electromagnetic fields. Egypt did not participate in that survey as data is not available (in the map green refers to the countries that participated while white refers to countries which did not. This participation is very important for a country like Egypt to know where we are standing among different countries in terms of applying appropriate standards.

China	Data not available
Colombia	Data not available
Comoros	Data not available
Congo	Data not available
Cook Islands	Data not available
Costa Rica	Data not available
Croatia	Data not available
● Cuba	Yes
● Cyprus	Yes
Czech Republic	Data not available
Côte d'Ivoire	Data not available
Democratic People's Republic of Korea	Data not available
Democratic Republic of the Congo	Data not available
Denmark	Data not available
Djibouti	Data not available
Dominica	Data not available
Dominican Republic	Data not available
Ecuador	Data not available
Egypt	Data not available
El Salvador	Data not available
Equatorial Guinea	Data not available
Eritrea	Data not available
Estonia	Data not available
Ethiopia	Data not available
Fiji	Data not available
● Finland	Yes
● France	Yes
Gabon	Data not available
Gambia	Data not available
Georgia	Data not available
● Germany	Yes
Ghana	Data not available
● Greece	Yes
Grenada	Data not available
Guatemala	Data not available
Guinea	Data not available
Guinea-Bissau	Data not available
Guyana	Data not available
Haiti	Data not available
Honduras	Data not available
Hungary	Data not available
Iceland	Data not available
India	Data not available



Source: WHO website http://gamapservr.who.int/gho/interactive_charts/phe/emf_standards/atlas.html

Finally, we can infer that the standards in Egypt that are issued by NTRA are not appropriate and strict enough to protect people's rights and health like other comparable countries, such as South Africa, Tunisia and Turkey. Also, the regulatory body in Egypt does not have power to enforce the standards.

According to the NTRA technical manager:

“in case of finding a violated tower station we announce it to the municipality in order to deal with such case”.

That means the role of monitoring the constructing cell phone towers in the residential areas is divided between the NTRA, as a regulatory body and the municipality as an enforcing and executive body. In more details, The role of the NTRA is mainly focuses on to what extent the mobile companies comply with the health and environment standards; while the role of the local government, represents by the municipality, focuses on the immediate intervention in case of violations and removing such violated towers as response of the NTRA's recommendations

4- The reasons behind the violations.

Q3- Why do mobile companies make violations, if any?

This is one of the major points in the data analysis because it demonstrates why such violations were conducted and why hundreds of cell phone mobile tower stations are seen in inappropriate places. Most of the Egyptians are not familiar with the standards to realize whether such cell phone towers are violating them or not. However, in some cases the violations are very obvious to be recognized by inexperienced eye. Therefore, to understand the reasons behind these violations, they could be categorized into three main categories:

First category: Reasons related to the mobile company itself.

Second category: Reasons related to the government

Third category: Reasons related to the residents' attitude toward this issue.

1) First category: the causality of that kind of violations done by the mobiles company itself.

According to one of the mobiles company's engineer:

“Each company has its own policy in dealing with the violations.”

In this category, there are two reasons that make the mobile companies violate and not adhere to the health and environment standards, which are:

a- Delivering good coverage

The coverage of the mobile network is very vital. In some cases, especially in the informal and poor areas, the companies are stuck with no alternative locations for the cell phone tower. Consequently, they were forced to violate in order to deliver a good coverage. In the high-end districts, it is a different story and there is no way to build a cell phone tower if the residents object to it.

According to one of the mobiles company's engineer:

“In case of the existence of a tower near to an airport or any military organizations, an immediate action should be taken to remove the tower.”

Nobody care about the violations in the poor areas, whereas the nepotism and the pressure from VIP people force the company to take an immediate action to remove the tower even if it will affect the service and cause the signal to be weak. Moreover, according to the interviews that were conducted with the mobile companies, they expressed providing good coverage as the main target for any mobiles company in Egypt regardless of the violations. Furthermore, delivering

good service through tower stations in such crowded and fully saturated areas might not totally adhere to the standards.

According to one of the mobile companies' engineer:

“For example, the company aims to construct a tower in a certain area as a response to a complaint about lack of coverage in a certain area or the capacity of the current station no longer sustains new services. For the sake of providing good coverage, nobody will consider the standards”

Also, another company's engineer mentioned that:

“Embaba is a very vital area because it has a high capacity of network users, which means that it needs more towers to deliver good coverage regardless of the standards.”

In line with that argument another engineer said that:

“In my company I can justify that I could not remove this violated tower because it will weaken the signal and it might lower the coverage of the service in this area.”

It can be concluded from the three examples of the different mobile companies that delivering good coverage is the main concern of each company; accordingly, violations may occur to maintain the coverage request.

b- Saving money

‘There is another indirect reason which is related to money; however, it is less important than the first one (delivering good coverage). From the mobile companies' perspective, the focus is mainly on the revenue, which is expected from such a business. It will be discussed below how this contributes to making violations when setting up cell phone tower stations.

According to one of the mobile companies' engineers:

“In some cases especially in the countryside, we are forced to build two towers with 60 meter height (which has high cost) because the residents in this village refused to set any towers inside the village”

This corresponds to the literature, as Mena (2011) stated what happened in 2011, when hundreds of people set fire and blocked the railway movement in Giza to protest against setting up a cell phone tower inside their village.

Another statement from another company:

“The cost of building a big tower on any land is too costly.”

The third statement by another mobile company engineer:

“Building a tower that has 12 meter height on the top of any building has less cost than a tower that has 45 meter height which is built on the ground”

In addition, removing such tower from its current location might be harmful to the company in terms of money saving. For that the company keep the violating tower as it is, for example,

One of the mobiles company's engineer:

“In some cases the company does nothing because the tower is settled and brings revenue to the company, therefore, it is too difficult to remove it.”

2) Second Category: Reasons related to the government

In the second category, the researcher will discuss the reasons behind the violations found as a result of the weak role of the NTRA. In addition, the Egyptian government contributes to these violations indirectly by not providing the mobile companies with suitable free land in order to set up the mobile phone towers away from the residential areas. In Egypt, most of the regulatory bodies do not have enough power to control the compliance with the health and environment standards, in other words, they do not have teeth and claw.

a- The weak role of the NTRA and local government

First, NTRA is the only regulatory authority agency in Egypt that manage and control the process of construction cell phone towers according to the health standards, however, in many cases the NTRA a regulatory body failed to enforce the mobile companies to comply with the standards.

One of the mobiles company's engineer said that:

“for example, according to the NTRA standards the distance between two towers on the same building must not be less that 12 meters. However, in reality, this does not happen in 70 percent of the cases.”

That means that it does not have enough power to either remove such violating towers or to set a fine or any sort of punishment in case of violations. Beside the NTRA, the local municipality also has weak role owing to the corruption and nepotism.

one of the mobiles company's engineer said that:

“After the issue is forwarded to the municipality, the corruption and manipulation play an important role by slowing down the process in order to keep the situation as it is.”

In addition, the Ministry of Environment is also considered as a government supervisory agency in this issue. It is sometimes stronger than the NTRA and applies fines on violating companies, in a way which should be considered the regulatory body in that telecommunications sector.

According to one of the mobiles company's engineer:

"In rare cases fines have been paid to the Ministry of Environment. "

Another mobiles company's engineer said that:

“The Ministry of Environment might put a huge fine on us in case of violations”

Despite the Ministry of Environment is able to put a fine on the violated companies, that happened in rare cases. such weak role directly helps the mobile companies to make violations without being afraid of punishment.

According to one of the mobiles company's engineer:

“The NTRA has no executive authority to remove the towers it just announces to the municipality that this tower is violating and you should take action towards it (remove the tower, cut the electricity, ...).”

There are several points regarding this issue that fit with the literature, for examples Farouk (2010) argued that: The Ministries of Communications and Health as well as the State Ministry of Environment stated that without taking any actions to make these standards mandatory, it would not be considered as a law.

Another mobile company's engineer said that:

“The only thing that NTRA can do in case of violations is to stop or withdraw the license of the new violating towers before their operation; however, no firm actions could be taken towards those already operational.”

Also, as claimed in Egypt home freedom house (2013), the weak role of the regulatory bodies, such as NTRA in Egypt, plays a very important role in making the citizens not trust the government.

Also, it complies with the literature as Satar (2015) stated that the NTRA's standards has not been respected by the mobile companies and they have not been subject to any sort of penalties such as fines and withdrawal of their licenses.

Definitely, this matches with the literature (Decentralization and Curbing Corruption in Local Government CIPE, 2009) that stated that even the telecommunications sector and the local government (municipalities) involved in the corruptions by percentages 22% and 62% respectively.

It seems that the environment and citizens' health are not considered as vital issues from the government's perspective, for instance according to the NTRA's standards, the distance between two towers at the same building must be at least 12 meters; however, The figure that is shown in appendix E, figure 8, is a good example of how the weak role of NTRA definitely makes the mobile companies not pay attention to the standards. In this figure, there are more than two towers and the distance between them could never be 12 meters by any means.

Furthermore, this is confirmed as a repeated case by the literature, as Mohamed (2001) argued that there is a tower that was set up next to a school on the top of building no 15 EL Sudan Street EL Mohandseen District.

b- Scarcity of lands

Second, in additions to the weak role of the NTRA, the government contributes to such violations by neither assigning nor renting appropriate spaces on public land to the mobile companies in order to set up a phone towers far enough from the residential areas(as shown in appendix E, figure 9)

Moreover, the scarcity of land, which can be used for constructing station towers away from the residential areas, also plays a very important role in conducting such violations.

As one of the mobile companies' engineers said that:

“There are no available free spaces to set up phone tower, especially in the informal and poor areas.”

Also, another mobile company engineer mentioned that:

“In some areas it was too difficult to build a tower outside the residential areas rather than put it on the roof, taking into consideration that the cost of building a big tower in an allocated space is too costly.”

The third mobile company's engineer said that:

“In the Gulf counties they have enough spaces to build such towers in open areas while in Egypt we don't have. Also, the government does not give a hand to the mobile companies by renting or even selling certain areas of public land.”

To sum up, also, scarcity of lands contributes indirectly by forcing the mobile companies in many cases to violate the NTRA standards.

C-building violations

Building violations are considered one of the most chronic problems in Egypt that negatively affects not only the telecommunications sector but also many sectors. Many buildings all over Egypt were constructed without any official permission or supervision from the government. Such violations mainly contribute to making the mobile companies not comply with the health and environmental standards.

Constructing a new building, that is private and residential or public such as school or hospitals may be close to another building that carries a tower station, especially in informal areas. This makes the tower in this situation incompatible with the NTRA standards, especially after 25th revolution.

For instance, a mobile company fulfilled all the requirement in order to set up a cell phone tower at the top of a certain building; however, all of a sudden another building was constructed close to the tower.

According to one of the mobile companies' Engineers:

“Some violations were out of our hands, sometimes we have a tower that was constructed adhering with the standards, but suddenly another building was constructed close to the tower (in the informal areas) in a way that made the tower in this situation in violation to the NTRA standards(specially after 25th revolution).

This means that such kind of violations is not the responsibility of the mobile companies, it is an external factor that is revealed as a result of the prevailing corruption in building violations, specially after the 25th revolution.

A statement from another mobiles company:

“Another building was constructed close to the tower (in the informal areas) and this building might be a nursery, in this situation, our phone tower will be considered as violating the NTRA standards”

According to the third mobiles company's engineer:

“Some reasons of violations are out of our hands owing to the violations in buildings that are close to our towers.”

As shown in appendix E, figure 10 and 11, there are some photos taken by the researcher showing some violations in this regard. Those photos show that there are clear violations to the NTRA's standard no two, which mentions that: *The height of the macro cell antennas must be more than that of the surrounding buildings within 10-meter-radius circle.*

3) Category three

It has been shown that the first category is very important in this issue and has high contribution percentage in doing violations owing to the companies themselves when constructing towers; the mobile companies always focus on achieving high revenues with the least cost possible. Also, the second category which demonstrates the weak role of the NTRA is considered as the backbone in the violation issue. Unfortunately, the regulatory body (NTRA) failed to ensure that the standards are followed in an appropriate way because it does not exercise the power to protect people's health. However, the third one is also important because it is related to the citizens and whether their attitude is influenced by gaining money through annual rent of their buildings' roofs or there is cultural ignorance regarding the standards.

a- Residents' attitude

First and foremost, residents' attitude also contributes to such violations which come from allowing the mobile companies to construct cell phone towers on the top of their buildings.

According to the interview with one of the mobile company's engineers:

“Citizens themselves try many times to offer their building's roof to set up a tower in order to collect money regardless whether it has negative impacts or not, given that the rent is considered a high value to those who live in poor areas (15000 to 30000 LE per year). Therefore, people always search for money even if it has potential harm whether to them or to their neighborhood.”

This is confirmed by the literature, as Salwa (2010) states that: the mobiles phone's company paid about "24 thousand pounds" to the owner of the building to allow the company set up a tower station regardless of the health hazard to the people who are living next to this tower.

In addition, Satar(2002) states that the main aim of many buildings owners is getting money from the mobile companies as an annual rent. Therefore, the owner gave a permission to set the

tower on the top of his building; accordingly, a fight arose between the building's owner and the residents.

That explains why nobody cares or asks about if such towers comply with the health and environment standards or not. Also, the reasons behind the residents' negative attitude is either that they benefit from constructing such towers as building owners or being afraid of getting themselves into trouble with the person who permit setting up of a tower on his building's roof. Moreover, it has to be taken into consideration that if the person is powerful enough in his neighborhood, nobody will dare to set a complaint against him.

Another mobiles company engineer said that:

“Setting a violating cell phone tower regardless of the standards might be done because the building's owner himself aims to collect money. The owner offers his building to have a new tower even if there is another tower that already set up on the roof and which belongs to another company, which makes two companies considered as violators.”

The three mobile companies try to keep the tower station safe from any sabotage as well as the people from any potential harm by setting a fence around the tower station. It helps the company to protect its business and keep people away from such danger. Also, to be in line with the 12 standards that were issued by the NTRA, one of the mobile companies engineer mentioned that:

“Putting a fence that surrounds the station is to protect it from any sabotage, as well as signs on the roof to keep the people away from the station which is above the roof.”

Another mobile company takes extra percussion to minimize potential the damage; according to one of the mobile company's engineer:

“We monitor the station 24 hours a day by setting up special cameras in the location of the tower to ensure the safety factors and to avoid any potential hazard to anyone.”

This is confirmed by the literature, as Farouk (2010) states that cell phone towers are considered a sort of danger, particularly, either to people who work in the construction process itself or those

who get close to it. Therefore, they should put signs or barriers to ban people from going to such dangerous areas. Though the companies set different safety factors, in some cases the residents themselves do not care about such safety factors and violate them in a way that makes the tower station inconsistent with the 12 standards. Moreover, sometimes the negative attitude of the people living in the building on which the tower is built leads to very destructive and unjustified actions.

People in the informal and poor areas are not aware enough of the danger caused by the cell phone tower stations and the negative impacts they may have on the long run.

According to one of the mobiles company's engineer:

“In the poor areas no one cares about the towers that violate the NTRA standards and should be removed, while in the high end district if the towers are close to a VIP person or near to a military organization, the towers will be removed in no time.”

According to the NTRA's project manager:

“People can break the door or the fans that protect the tower stations from any sabotaging or shut down the power generator that feeds the station with electricity regardless of the negative impacts that might be caused from being too close to the antenna”

As a result, the tower station in this case is considered as a violating tower as the NTRA's technical manager said:

"All the 12 standards must be applied at the same time, which means that breaking the door or fans which surround the station makes it not compatible with the standards.

Direct exposure to the waves emissions from the tower might cause damage to the health of those who get closer to it. Also, they may damage the station by making it out of service.

Moreover, working inside the stations requires many precautions and has to be done by experts who know quite well what they are doing. Unfortunately, people's culture in some areas does not respect the rules whether for protecting the stations or themselves.

b- Residents' culture

Second, people's negative attitude and misbehavior can be justified by their ignorance, which also plays a very important role.

According to one of the mobile companies' engineers:

"Onetime when we were constructing a tower in a poor area, someone told me that: I know that such towers have Facebook inside it, therefore, I want to benefit from the high speed by accessing my account directly from the tower."

Also another engineer stated that:

"In some cases, people ask to get internet connections from the stations."

So, the only concern of some persons in such areas (informal and poor areas) is internet connections to access applications, regardless of the dangerous effect on them due to the exposure to direct emissions.

Finally, we can summarize the reasons behind the violations into five main points:

- **Residents'** attitude: The building's owner could allow a mobiles company to build a tower on his roof while there is already another one that belongs to another company, which accordingly violates NTRA standards.

- **Residents'** culture and ignorance in some areas (such as informal areas) that does not respect the rules. For instance, damaging the equipment in a way that turns the tower station tower to be non compliant to the standards.
- Building violations: Constructing a new building close to the tower station (especially in informal areas), makes the tower incompatible with the NTRA standards (especially after 25th revolution).
- Weak role of the NTRA and local government: The NTRA is only a regulatory authority agency and not an executive agency; it does not have enough power to remove violating tower. Also, the local municipality also has weak role owing to the corruption and nepotism.
- Scarcity of land, which can be used for constructing tower station away from the residential areas, also increases the probability of violation.
- Delivering good coverage in such crowded areas (informal and poor areas) and saving money to the mobile companies by reducing the cost of setting up the towers and getting high revenue as well.

5- Perceptions about the negative impacts on health and environment

Q4-What are the negative impacts?

Research in the issue of the cell phone towers and their impacts on the environment and public health is divided among those who confirm the harmful effect and those who deny it.

Not only in Egypt but also all over the world, the negative impacts from constructing cell phone towers in the residential areas are still debatable and no one can prove it. On the other hand, there are many international published papers that also claim that it has severe negative impacts,

particularly in case of not complying with the health and environment standards. However, these impacts are not well specified so far.

According to the mobile company's engineer:

“The cell phone tower stations do not harm as well as it does not have any negative impacts unless it does not comply with the health standards.”

Moreover, the second company engineer said that:

"Till now, there is no tangible evidence that proves that it has negative impacts and by looking into what we eat in Egypt, we can find much more factors that cause cancer."

Some literature confirms this view as stated by Australia Vodafone (2014): *"There is no tangible scientific evidence that proves the exposure to such weak RF (radio frequency) signals that is produced by base station towers could cause any adverse health effects."*

Also, it matches with other sources of literature as Olukolajo (2013) stated that in conclusion, there is a big number of scientific studies that agree that the exposure of RF radiation does not have either direct or indirect effect on health; and did not cause any health problems such as cancer, heart, high blood pressure, the immune system or hormonal effects.

However, the mobile companies' engineers emphasize that not complying with the health and environment standards, as well as staying for a long time near station towers might be dangerous. It could cause many diseases such as, cancer and mental disorders in case the towers are not adhering to the health standards.

For instance, according to the third mobile company's engineer:

"The violating towers might have negative impacts but they are still unknown. Therefore, in our company we should be on the safe side and avoid any potential damage that might happen"

That fits with the literature as Kumar (2010) stated that in many cases, the radiation goes above the standards established by ICNIRP, in a way that incurs people to risk especially, older people, house wives, and small children living next to cell phone towers.

Moreover, one of the mobile companies mentioned that:

"The human should not stay in front of the antenna for a long time and the distance should not be less than six meter according to the NTRA. Violating this might cause negative impacts."

Furthermore, as stated at the Electromagnetic and Radiofrequency Fields website, there are many reports of hypersensitivity and diseases that might be found as a result of the exposure to the electromagnetic field and RF, such as cancer, neurological disease, reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity. Regarding the negative health reports that were published by some Egyptian and international newspapers, one of the mobile company's engineers said that:

"During the last 15 years, the issue regarding that the cell phone tower stations that they have negative impact is still debatable. Moreover, such reports did not affect our work"

This is also reflected in the literature as Sir William Stewart, Britain's official health protection watchdog, has published two reports that advice people to reduce using cell phone as much as they can specially in schools. However, his request did not get any attention from the ministers' council. In addition, one of the mobile company's engineers said that:

"For example, many years ago, there was no clue that proves that the cigarette is one of the elements that cause cancer. Which means in the future we might find out that the Mobile towers have negative impacts on health."

Mobile companies are still constructing towers so far there is no clue about whether radiation emitted from the cell phone tower has negative impact or not. In other words, it was not proved that the cell phone towers have negative impacts, so the companies think why should we worry about issues that have not been resolved till now?

One of the main points that were mentioned in the interviews is some people are panic from setting up cell phone towers in the residential areas especially in the informal areas.

For instance, the mobile company's engineer said that:

"For example, in Saft EL Laban area, when we were setting up a tower, one of the president's wives fought with us because she said that such tower will negatively affect her husband's fertility. Accordingly, we changed the physical location of the tower to another building rather than setting it directly towards their building."

Therefore, one of the mobile company's engineers suggested that:

"Making campaigns and advertisement in order to show that cell phone towers have no negative impacts unless they do not follow the NTRA standards."

That shows the three mobile companies in Egypt claim that cell phone tower stations constructed on the buildings' roofs do not have negative impacts unless they do not comply with the health and environment standards.

6- The influencing factors

Q5-What are the influencing factors that will make the companies adhere to the standards?

There are two main influencing factors that could be applied in Egypt in order to make the mobile companies adhere to the standards as follow:

a-Forcing the violated compaines to pay a huge fine to minimize the violations.

It is recommended that the NTRA sould have the authority to apply fine or sanctions similer to many countires, for example, Turkey. According to the Turkish law that manage setting up the cell phone tower in Turkey, in case of violation, in the Article 23 the operation of this station will be stopped by the official governors. Moreover, if it doesn't work the operator will pay a fine about 50 times the registration fee as stated in the wireless tariff. We can infer that applying huge fine will definitely minimize the number of violations eventually. Also, it will be beneficial to apply such regulation in Egypt not only to stop the violations as much as we can but also to get money from such fines that can use in many useful ways.

b-Making an incentive system that could encourgue the mobiles compaines to reduce the violations

The NTRA should firstly help the violating companies to find out alternative solutions given that in some situations the violations was out of the companies' hands, as mentioned in the violations building. Also, in some violations it is too difficult to remove the tower in a way that might weaken the signal. Furthermore, the government could give incentives to the good companies in a way that could encourage the companies to reduce the violations. This kind of incentives system is applied in different sectors for example, The European Bank for Reconstruction and Development (EBRD) has played a very vital role in this issue. It was providing aboutUS\$28 million to one of the oil service company which is called Advanced Energy Systems SAE (ADES) as a reword of adhering to the health and environment standards

Chapter 6: Conclusion and recommendations

Complying with health and environment standards has become one of the main concerns for many researches and scientists all over the world including Egypt, and has a recent boomed in the telecommunications sector in the last 15 years. The telecommunication technology might have some negative impact in terms of adhering to the health and environment standards. Therefore, many governments, including Egypt, have legislated standards to arrange the businesses and industries that could affect the environment such as chemical industries, cement industries, and telecommunication sector, particularly constructing cell phone towers in the residential areas in Egypt, which is the main concern in this thesis. Therefore, this research mainly aims to examine to what extend the mobile companies adhere to health and environment standards as well as discussing the quality of the standards themselves compared to other countries. Moreover, it examines the negative impact from many different perspectives.

This research relied on the qualitative method in collecting data, using in depth interviews with the three mobile companies and the NTRA. The literature review demonstrates that few articles cover the issue; most of them are medical papers that tackle the issue from the medical or the engineering perception.

This thesis endeavored to find out whether mobile phone companies lack the commitment to the standards in constructing cell phone towers especially in the residential areas, and why. It therefore investigated the role of the government represented by the NTRA. Furthermore, it also looked into the role of people themselves as property owners and residents in and around the cell phone towers, are whether they are aware of the negative impact and the consequences of violating the standards on their health and the environment and the impact on the motivation to the mobile companies to violate the standards regardless of the people's health.

a-Findings

After investigating and analyzing the collecting data, it is found that the mobile companies in Egypt do not comply to the health and environment standards in many cases. Also, they are always looking for keeping the violating towers as they are as much as they can. Removing the towers or readjusting their position is too costly that leads the mobile companies to violate eventually.

Moreover, there are many reasons behind such violations that are founded as a result for the weak role of the government. Some reasons belong to the mobile companies themselves while others belong to either the government (NTRA) or the citizens themselves. To sum up the reasons are:

- Delivering good coverage, in some situations the coverage is very vital, especially in the informal and poor areas.
- People's attitude: building's owner money-seeking attitude could encourage him to allow a mobile company to build a tower on the roof while the roof already has one that belongs to another company, neglecting the NTRA standards.
- Building violations: constructing a new building, that may be a school or a hospital, close to the tower station makes the tower in this situation incompatible with the NTRA standards (especially after 25th revolution).
- Weak role of the NTRA and local government: The NTRA is only regulatory authority agency not executive agency; that means it does not have enough power to remove such violator tower. Also, the local municipality also has weak role owing to the corruption and nepotism.

- People's culture in areas such as informal and poor areas that doesn't respect the rules. For instance, damaging the equipment in a way that turns the station tower to be incompatible to the standards.
- Scarcity of land, which can be used for constructing station towers away of the residential areas, also increases the probability of violation.

In additions to that, the standards in Egypt that are issued by NTRA are not strict enough to protect people's rights and health like many comparable countries such as south Africa, Tunisia and Turkey. Also, the main important findings in this research is that the regulatory body in Egypt has no power either to protect people's health specially in poor areas or even to take an action with any violations. NTRA has no authority to either remove the violation or to apply fines and penalties.

Furthermore, regarding the negative impact of installing cell phone towers in residential areas, this research shows that the three mobile companies in Egypt claim that cell phone towers stations on the building's roof have no negative impact at all. However, not complying with the health and environment standards might make the towers a source of danger especially to those who live close to them.

b-Research recommendations:

The research concludes to some recommendations as follows:

1-Launching a campaign using advertisement by the government, the mobile companies or both, in order to raise awareness about the NTRA health and environment standards and the negative impact if they are not adhered to. This kind of campaign will help people understand the whole picture about such important issue. Taking into consideration that the three mobile's company in Egypt claim that cell phone towers stations on the building's roof has no negative impact unless it is not complying with the health and environment standards. Not complying with the standards might make it as a source of dangerous specially, to those who live closed to towers.

2-Similer to Turkey, the regulatory body in Egypt (NTRA) should enforce with enough power and authority the standards in order to be the keeper of the citizen's rights and health. In Turkey, according to the law, article 5: The operator who violates or builds a tower station that does not adhere to the safety standards will be given only 10 working days to modify such illegal situation otherwise and according to the Article 23, the operator of this station will be stopped by the official governors. As seen, the regulations in Turkey are a law that give the regulatory body strong power to do its job. Therefore, it is strongly recommended to change the policy that manages the NTEA's role to make it executive body (have strong mandates) not just regulator body. Another option is to regulate the coordination between NTRA as a regulatory body and local government as an executive body for dealing with the cell phone towers violations, while creating a

financial incentive for local government employees when applying the penalties on the cases of violations.

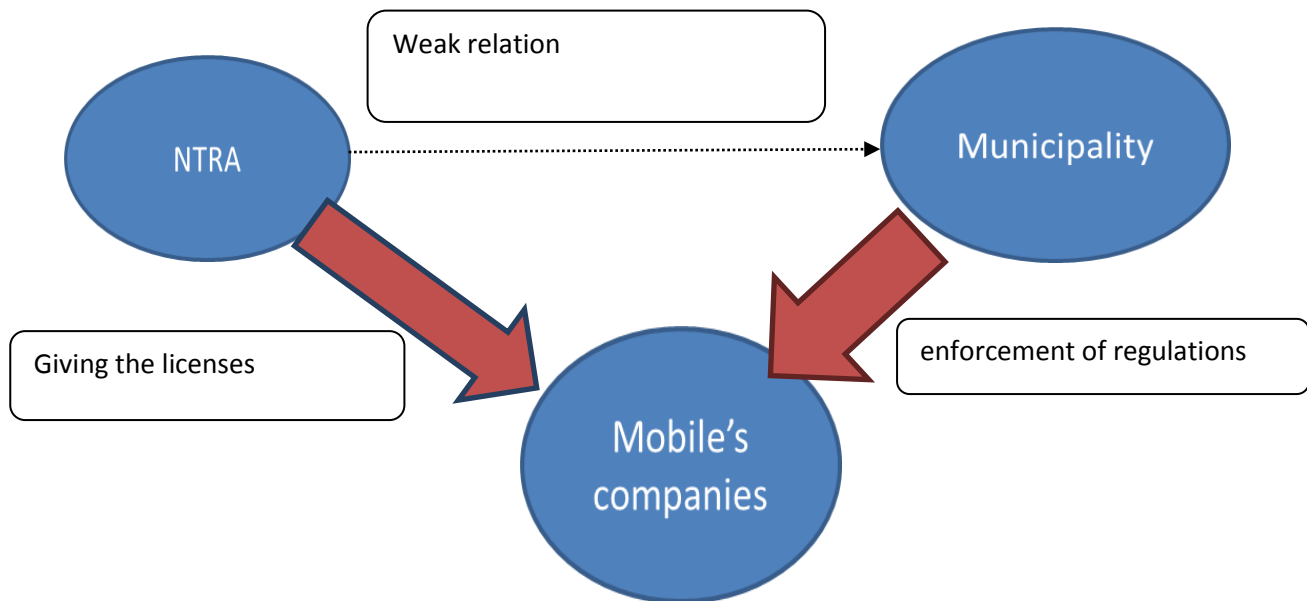
3- The 12 standards that are issued by the NTRA should be reviewed according to the current circumstance in Egypt (the increasing of the no of mobile phones). Also, setting up one fixed distance is not appropriate given that each tower station has different power emission. For instance, as Abdel-Rassoul (2007) stated that the level of exposure varies based on the number of the phone calls all over the country which means the increase of the number of phone mobiles using the base tower stations will increase the radiations from the cell phone towers (Abdel-Rassoul, 2007). Therefore, such standards should be reviewed carefully to be adequate to the expected substantial increase in the number of the mobile phones.

4-Cooperation with the other mobile companies' projects is highly recommended in order to eventually reduce the number of towers, consequently reducing the negative impact on human health. In technical terms, the tower in this project should has antennas in which has 12 port instead of 6 ports. It means that the one antenna can operate with two companies (as shown in appendix E, figure 12).

For example, the same towers can carry many antennas for different companies. However, such project it just a pilot project and was not applied in an official way. Therefore, the government should generalize such project in order to not only reduce the negative impact by reducing the number of towers but also to minimize the capital investment for the mobile company. So, both of mobile companies and citizens will benefit from such project.

5-The NTRA should first help the violating companies to find out alternative solutions given that in some situations the violations are out of the companies' hands. Also, in some violations it is too difficult to remove the tower in a way that might weaken the signal. Furthermore, the government could give incentives to compliant companies in a way that could encourage the companies to reduce the violations. This kind of incentives' system is applied in different sectors; for example, in the oil services sector, encouraging and supporting any company that adheres and applies the environmental, health and safety (EHS) standards in a professional matter.

6-Moreover, the connections between the NTRA and the municipality are weak and it is considered as a limited channel, for instance NTRA tell the municipality that a tower is violating the standards. That means as referred to in the figure below that it is just like a thin line and there is no any sort of follow up to ensure that the violations have been removed. Therefore, the government should strength such connections between the NTRA and the municipality through a coordination channel similar to the connection between the NTRA and the mobile companies.



c-Future research recommendations:

It is recommended that the future research should shed more light on some aspects that need to be tackled in depth such as:

- ❖ The relation between the municipality and the NTRA in case of violations is not clear enough.
- ❖ Reforming the telecommunication sector in Egypt including the NTRA in terms of updating the health and environment standards.
- ❖ Finding out alternative solutions to ban the violations in a way that not to be harmful for the mobile companies as well as citizens.
- ❖ Creating incentives system that could encourage the mobile companies to reduce the violations to the minimum level.
- ❖ Discussing how the profit could drive the role of the mobile companies and government regardless the people's health.

- ❖ Demonstrating the role of the corporate social responsibility (CSR) in this issue and the lack of sense of community.
- ❖ Discussing the adhering to the health and environment standards in other polluting fields, such as cement industries, steel industries

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Appendices

Appendix A: IRB approval

CASE #2014-2015-123

 THE AMERICAN UNIVERSITY IN CAIRO
INSTITUTIONAL REVIEW BOARD

To: Mohamed Mostafa Ibrahim
Cc: Hakan Uraz
From: Atta Gebril, Chair of the IRB
Date: May 2, 2015
Re: Approval of study

This is to inform you that I reviewed your revised research proposal entitled "Compliance of corporate businesses to health and environment standards: The case of cell phone towers in Egypt" and determined that it required consultation with the IRB under the "expedited" heading. As you are aware, the members of the IRB suggested certain revisions to the original proposal, but your new version addresses these concerns successfully. The revised proposal used appropriate procedures to minimize risks to human subjects and that adequate provision was made for confidentiality and data anonymity of participants in any published record. I believe you will also make adequate provision for obtaining informed consent of the participants.

This approval letter was issued under the assumption that you have not started data collection for your research project. Any data collected before receiving this letter could not be used since this is a violation of the IRB policy.

Please note that IRB approval does not automatically ensure approval by CAPMAS, an Egyptian government agency responsible for approving some types of off-campus research. CAPMAS issues are handled at AUC by the office of the University Counsellor, Dr. Amr Salama. The IRB is not in a position to offer any opinion on CAPMAS issues, and takes no responsibility for obtaining CAPMAS approval.

This approval is valid for only one year. In case you have not finished data collection within a year, you need to apply for an extension.

Thank you and good luck.



Dr. Atta Gebril
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Appendix B: NTRA standards

(The standards copied from the NTRA web site

http://www.tra.gov.eg/english/dpages_dpagedetails.asp?ID=215&Menu=1)

Category 1

Building Standards

- 1- The height of the building on the top of which antennae is to be installed should range from minimum 15 meters to maximum 50 meters from ground level inside the residential area.
- 2- The height of the Macro cell antennas must be more than that of the surrounding buildings within 10-meter-radius circle.
- 3- The roof of the building (on which the antennas are fixed) must be made of reinforced concrete.
- 4- It is prohibited to install more than one transmitting antenna on the same mast. In case more than one antenna are installed, a metal pylon could be fixed in a way that the antennas mounted are at least 6 meters high measured from the roof of the building. No more than 3 transmitting antennas and three receiving antennas should be mounted on the same level.
- 5- The horizontal distance between the centers of two pylons on the same building must not be less than 12 meters.
- 6- The antennas used must be high-gain antennas and the front gain compared to the back gain must not be less than 20 db.
- 7- It is prohibited to install antennas on top of balconies that are not protected by a ceiling made of reinforced concrete.

Category 2

Health and environment standards

8- When the antennas are mounted, the horizontal distance between them and human beings must be not less than 6 meters in the direction of the main beam.

9- Antennas cannot be installed on buildings that are completely utilized as hospitals to avoid any interference with the medical devices used.

10- On installing the stations, mobile operators must abide by international standards of the permissible electromagnetic power density emitting from the antennas. Standards are issued by the World Health Organization (WHO), American National Standards Institute (ANSI), International Electro-technical Committee (IEC), International Commission on Non-ionizing Radiation Protection (ICNIRP), Institute of Electrical and Electronic Engineering (IEEE). The maximum permissible power density a human being can be safely exposed to must not exceed 0.4 mW/cm² (CDMA-GSM 900 MHZ- GSM 1800 MHZ). The endorsed technology of measurement should be identified.

11- To ensure that antennas are not approached, the roof should be entirely closed otherwise pylons and masts should be surrounded with non-metal fence surrounding the pylon on a distance of 6 meters from its center. Masts fixed on the edge of the building roof shall be surrounded by a fence at a distance of 2 meters from its center. Warning signs should be fixed.

12- The distance between the antennas' main beam and the playgrounds of children's schools should not be less than 20 meters as children are more vulnerable to external effects than others.

Appendix C: Interview's field's questions for mobile companies

In-depth interviews with engineers from the construction cell phone towers department in the three

Mobile companies (MobiNil, Vodafone, Etisalat)

What are the international standards that you are follow in constructing cell phone towers?

Does Egypt have its own standards?

What are the procedures that are taken in order to construct cell phone tower?

What are the safety factors that consider?

Why can't the base stations be built away from residential area?

Does the presence of a base station on top of a building create reason to worry for the residents of that building?

What Is the government supervision that stratify on constructing cell phone towers?

To what extend do you deal with the violator towers? Do you either remove it or readjust?

Are there any damaging health hazards from mobile phone waves?

Who does the inspection process a team from the NTRA itself or an international team can be evoked from outside Egypt?

What about the negative health reports that were published by some Egyptian and international newspapers?

So why are the people worried and expressed fears about that?

Appendix D: Interview's field's questions for NTRA

In depth interviews with managers from the supervision and inspection department in the National Telecommunications Regulator Authority (NTRA)

What are the mandates that help the NTRA to control the telecommunication in Egypt?

What are the different standards for constructing cell phone towers in the Residential Areas?

Why the international standards are varying from country to another?

Does Egypt have its own standards?

In the luxurious district, the towers built away from residential area while it not in the informal areas?

What are the procedures that are taken against any violating towers?

How the mobile companies follow the standards in Egypt?

What are the obstacles that resist NTRA to regulate the constructing cell phone towers in the Residential Areas in Egypt?

Is there any frequently inspection on the cell phone towers in Egypt?

Do cellular phone towers cause any other health problems?

What are the global recommendations for base stations and mobile phone safe usage?

What the people should do if they witness a violator towers and also what should do if they've been exposed to cellular phone towers?

Appendix E: photos



Captured on 2-6-2015 by the researcher Figure 1



Captured on 18-6-2015 by the researcher Figure 2



Captured on 2-6-2015 by the researcher Figure 3



Captured on 5-7-2015 by the researcher Figure 4



Figure 5

(Source: The city of Cape Town website

<https://www.capetown.gov.za/en/Pages/Results.aspx?k=TELECOMMUNICATION%20INFRASTRUCTURE%20POLICY>)



South Africa figure 6

(Source: The city of Cape Town website

<https://www.capetown.gov.za/en/Pages/Results.aspx?k=TELECOMMUNICATION%20INFRASTRUCTURE%20POLICY>)



Captured on 2-6-2015 by the researcher Ring road EL Moneeb

Egypt figure 7



Captured on 30-10-2015 by the researcher Giza Fisal street figure 8



Captured on 2-6-2015 by the researcher Giza Ring road figure 9



Captured on 18-8-2015 by the researcher
Rina road ALTalbiva district figure 10



Captured on 23-9-2015 by the researcher



Captured on 30-10-2015 by the researcher Cairo Sheraton district figure 11

Components of Cell-Site



figure 12

<http://www.gtlinfra.com/passiveconcepts.asp>