

# The Impact of Electromagnetic Pollution on Human Health and Environment: Recommendation for an Effective Regulatory Framework in Bangladesh

Arif Mahmud<sup>1\*</sup>, Md. Rashedul Islam<sup>2</sup>, Sabikunnahar Noni<sup>3</sup> and Md. Mahabub Ul Alam Khan<sup>4</sup>

<sup>1</sup>*Department of Law, Daffodil International University, Dhaka, Bangladesh*

<sup>2</sup>*Department of Journalism, Media and Communication, Daffodil International University*

<sup>3</sup>*Department of Law, Daffodil International University*

<sup>4</sup>*Final Year LL.B student, Department of Law, Daffodil International University*

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## ABSTRACT

In this era of modern technologies, our social life is surrounded by various electronic devices and pieces of equipment. These generated electromagnetic fields and cause electromagnetic radiation. As a result, modern technologies are one of the major sources of electromagnetic pollution. Human-made electromagnetic pollution is far greater and powerful than the radiation made from any natural electromagnetic fields source. Electromagnetic pollution is becoming more serious by the day, due to the rapid advancement of electronic technology and especially by the mobile phone base transmitter stations (BTS). As a result, many countries have paid attention to it, and it has been added to the list of public hazards that must be addressed through an effective regulatory framework. In that context, the objective of this paper is to find the cause of electromagnetic pollution in Bangladesh, measuring the impact and providing recommendation for effective regulation to mitigate the pollution.

**Key words:** *Electromagnetic pollution, Electromagnetic radiation, Radiation and pollution, Electromagnetic pollution regulation*

## Introduction

In this era of modern technologies, our social life is surrounded by various electronic devices and pieces of equipment. These generated electromagnetic fields and cause electromagnetic radiation. As a result, modern technologies are one of the major sources of electromagnetic pollution. Human-made electromagnetic pollution is far greater and powerful than the radiation made from any natural electromagnetic fields source. In our daily social life, we are exposed to radiation-caused electromagnetic pollution made from laptops, smartphones, elec-

tronic notebooks, power transmission cables, and radio communication. The worldwide adoption of mobile phones has necessitated increased coverage and a large number of mobile base towers. Cell phones and tablets have become the best-specialized instruments, particularly in urban areas. In a world of 7.4 billion people, the number of cell phone users has risen to 5 billion, according to statistics (Vishnu *et al.*, 2011). The number of internet users in Bangladesh is rapidly increasing, and as a result, people are getting more dependent on smartphones. Currently, there are more than 90 million smartphone users (Haque, 2019). According to

<sup>1,2,3</sup>Lecturer

“Bangladesh Telecommunication Regulatory Commission” (BTRC), the total number of internet subscribers are almost 99.984 Million at the end of February 2020 (BTRC, 2020). With the rise in mobile phone, use has come an inevitable rise in the number of mobile phone base transmitter stations (BTS), as well as public concern about the potential health risks associated with exposure to EMW emitted by BTS. In recent years, people are getting affected by radiofrequency (RF) fields through cellphone towers and equipment or tools used for radio communication (López-Furelos *et al.*, 2016). As of late, the number of cell phone towers being built in residential areas is increasing at the same time, and the coverage area of these waves sometimes includes human beings very closely, especially when the tower is erected on a rooftop. In Bangladesh, cell tower antennas are made in three frequency ranges: 900MHz, 1800MHz, and 2100MHz, and are used to provide up to 4G services by various operators (Hoque *et al.*, 2013). Wireless communication between the user equipment and a network is enabled by BTSs, which are radio transmitters mounted on free-standing masts or buildings. Macrocell base station antennas are typically installed on 10–30 meter tall free-standing towers, short towers atop buildings, or on the sides of buildings. Each tower typically houses three antennas, each of which transmits into a 120-degree sector. The main beam is slightly angled downwards, but it does not reach ground level until at least 50 meters (usually 50–200 meters) from the tower. The radio signals are encouraged to the receiving wires utilizing cables and after that broadcast as radio waves into the range or cell encompassing the BTS (Neubauer *et al.*, 2003). When people are exposed to BTS radio waves, their exposure is much more consistent across their entire body than when they are exposed to a mobile phone. (Independent Expert Group on Mobile Phones, 2000). In Bangladesh, three types of mobile towers are currently in use. “Roof Top Towers, Green Field Towers, and Green Field Roof Top Towers” are the three types. There are also three indicators for measuring radiation across the four frequency bands. In Bangladesh, all indicators have exceeded the World Health Organization’s recommended level of radiation. (Rahman, 2019). Power density, which is defined as the amount of power per unit volume, is the first metric. “CDMA450-2.2 W/M, GSM900-4.7 W/M, GSM1800-9.0 W/M, and UTMS-10.01 W/M” are the World Health

Organization’s power density safety limits for different frequency bands. The Bangladesh Telecommunication Regulatory Commission, on the other hand, measured the radiated power density of mobile tower sites and found that it was “CDMA450-2.5 W/M, GSM900- 10.38 W/M, GSM1800-10.35 W/M, UTMS-5.5 W/M.” The second indicator is electric field strength, which is a numerical expression of an electric field’s intensity at a specific location. CDMA450-29 V/M, GSM900-42 V/M, GSM1800-58 V/M, and UTMS-61 V/M are the WHO’s standard limits for electric field strength. “CDMA450-62.56 V/M, GSM900-51.05 V/M, GSM1800-71.50 V/M,” and “UTMS-65.05 V/M” are the electric field values used by BTRC at different frequency bands of mobile towers. The third metric is the specific absorption rate, which is proportional to the electric field value and the rate of absorption by human tissue. The standard value of the specific absorption rate of various frequencies, according to the World Health Organization, is 1.66 w/kg. “CDMA450- 1.75 w/kg, GSM900- 1.83 w/kg, GSM1800- 1.91 w/kg, UTMS- 2.05 w/kg” are the absorption rates at various frequencies in Bangladesh (Reza, 2017). We can easily understand Bangladesh’s radiation status based on the evidence presented above. Excessive cell tower radiation has an impact on birds, animals, plants, the environment, and public health in this context.

### **The Impact of Electromagnetic Pollution on Human Health and Environment**

Excessive radiation from cell towers, according to the WHO, is harmful to public health and the environment. Cell phone and cell tower radiation have an impact on birds, animals, plants, and the environment. Any insects or birds flying near the cell tower would never be seen. The reason for this is that a bird’s surface area is larger than its weight in comparison to a human body, allowing them to absorb more radiation. A sudden disappearance of bees was reported in several countries several years ago, and it was linked to rising electromagnetic pollution. Colony Collapse Disorder occurs when bees are unable to return to the hive due to persistent electromagnetic background noise that disrupts intercellular communication within individual bees. According to a European Union survey, about a quarter of Europeans (23%) are aware that EMW is produced by control lines, portable communication towers, cellphones, portable workstations, radar

gear, household apparatuses, remote computer systems, acceptance radiators, and anti-theft gadgets are all illustrations of things that can be found within the domestic (Santini *et al.*, 2003). The “Independent Expert Group on Mobile Phones (IEGMP)” under the direction of Sir William Stewart published a report on “Mobile Phones and Health” in May 2000, which describes in paragraph 3.5 various symptoms that were most commonly attributed to the base stations at the hearings: “headaches, sleep disturbance, depression, stress, and tiredness.” (Independent Expert Group on Mobile Phones, 2000). Aesthetic consequences were also noted. “Sleep disturbances, fatigue, anxiety, stress, epileptic fits, burning sensations, and shaking” were the most commonly reported health effects (Huss *et al.*, 2004). In Austria, there have also been numerous reports from the public attributing various health and well-being problems to BTS exposure (Oberfeld, 2012). The symptoms reported matched those listed in the IEGMP report to a large extent. In addition, residents reported “cardiac dysrhythmia, high blood pressure, forgetfulness, hearing difficulties, eye burning, and infection susceptibility”, all of which improved or disappeared when they moved (Regel, 2006). An alarming result was discovered in a medical survey of 220 people in Gulshan, an affluent district of Dhaka, and Mohammadpur, Bangladesh. Almost half of those polled said they had “trouble sleeping” (49.1%), had recent “headaches or dizziness” (47.3%), and had “mood swings, anxiety, or depression” (41.4 percent). Only 11 people said they felt a burning sensation all over their body, and four people said they were shaking or having fits. “Mood swings, buzzing in the head, hopelessness, palpitation, tachycardia, heaviness in the chest, anorexia, diarrhea, and skin diseases” were among the other health effects mentioned by 48 respondents (21.8 percent). Sleep disorders (58 percent), headaches (41 percent), nervousness or distress (19 percent), fatigue (18 percent), and concentration difficulties were the most common effects of electromagnetic pollution, according to another report (Röösli, 2004). “Sleep disturbances, irritability, depression, blurred vision, concentration difficulties, nausea, lack of appetite, headaches, and vertigo” have all been reported in people who live near base stations in other studies (Preece *et al.*, 2007). The radiation emitted by a tower per square meter ranges from 17, 100 microwatts to 72, 000 micro-watts, according to telecommunications expert Dr. Satyaprashad Majumder.

The human body can withstand up to 1,000 microwatts of radiation, but birds and flying animals cannot withstand more than 40,000 microwatts of radiation (Shawki, 2019). Due to interference from the new “unseen enemy,” a large number of birds such as pigeons, sparrows, and swans are becoming lost. In recent decades, the population of house sparrows has been steadily dropping. A stable house sparrow population indicates a healthy environment for people in terms of air and water quality, vegetation, and other environmental quality factors. A declining population of the bird, on the other hand, is a warning that the urban ecosystem is undergoing some environmental changes that will be harmful to human health shortly. Cows grazing near cell towers has been shown to have a higher risk of stillbirths, spontaneous abortions, birth deformities, behavioral issues, and overall health decline. Cattle herds have reportedly improved their health after being moved away from such towers. Magnetic fields can cause a decrease in milk yield, a change in milk composition, and fertility issues in dairy cows. (Reza, 2019).

#### **Existing Regulatory Framework against the Pollution**

Under Section 58 read with Sections 30(l)(g), 30(2k), 30(2l), and 31 of the “Bangladesh Telecommunication Regulation Act, 2001”, the “Bangladesh Telecommunication Regulatory Commission” (BTRC) has the authority to issue necessary directions to any person (natural or legal u.hatsoever) to regulate the harmful effects of all kinds of electromagnetic radiation in Bangladesh (Bangladesh Telecommunication Regulation Act, 2001). According to Section 34(c) of the Act, the government of Bangladesh has the authority to make guidelines for any telecommunication service matter and to take appropriate action unless the Act contains insufficient rules; as a result, the government has entrusted the BTRC with the task of formulating regulations/guidelines on Electro Magnetic Field (EMF) radiation. The Bangladesh Telecommunication Regulatory Commission (BTRC) has issued “Guidelines for Limiting Exposure to Electromagnetic Fields (up to 300 GHz)” to regulate the harmful effects of all types of EMR in Bangladesh under “section 58 of the BTRC Act”, with the government’s prior approval. For Power Density (10/50 W/m<sup>2</sup>), Electric Field Strength (61/137 V/m), Magnetic Field Strength (0.16/0.36 A/m), and Specific Absorption Ratio (.08/0.4 W/kg), the BTRC has proposed guidelines

for the general public and occupational exposure limits for 6 minutes averaging time. They adhered to the ICNIRP guidelines without making any modifications. It took four years to debate, decide, and accept the Guidelines. In many cases, mobile companies do not adhere to these guidelines, and the lack of proper monitoring has increased society's electromagnetic pollution. A rights organization called HRPB (Human Rights and Peace for Bangladesh) filed a writ petition in October 2012, asking the court to issue an order prohibiting mobile phone tower radiation. In March 2017, the health ministry presented an expert committee report to the HC (High Court) in conjunction with the finding that radiation from a carrier's cell tower exceeds the WHO limit. The human health and environmental cycle, according to WHO, is confronted by the challenges posed by unending radiation. In response to a petition filed in April of this year, eleven directives were issued to protect people, animals, and trees from harmful mobile phone tower radiation. The court ordered that no mobile phone towers be installed on rooftops of "residences, schools, colleges, playing fields, populated areas, or heritage areas". Those that were previously installed in such areas should be removed. In addition, the HC bench directed the concerned authorities to take steps to reduce mobile phone tower radiation by 1% out of a total of 10%. It also directed the appropriate authorities to take steps to ensure that mobile operators do not exceed the established radiation limit. It requested that the relevant authorities notify the HC if there are any restrictions on land acquisition for cell phone tower installation. The bench ordered the BTRC to set up a monitoring cell to look into the public health risks posed by mobile phone tower radiation. It also requested that all high-radiation mobile phone towers be replaced by the appropriate authorities. The HC bench also ordered the BTRC to make verification a requirement for the installation of cell phone towers. Authorities were also instructed to take steps to write the SAR on the phone. The HC bench stated that it would issue further directives in this regard after the authorities were concerned to submit a report following its orders (Independent Staff Report, 2019). In addition, the tribunal recommends that the BTRC (Bangladesh Telecommunication Regulatory Commission) establish a monitoring cell to track health issues caused by cell tower radiation (HC asks BTRC).

### **Recommendation for an Effective Regulatory Framework**

The World Health Organization's guidelines can be applied to upright towers and transmission frequency; towers, both ground-based and roof-based, should not be installed within 50 meters of schools or hospitals, and new towers should be placed 50 meters away. Cell tower radiation should be monitored 24 hours a day in both urban and rural areas, antennas ought to be mounted 30 meters over the ground or over, warning signs should be placed near cell towers to warn people about the dangers of radiation, and a hotline should be established where people can call or write about their radiation problems. In 2009, our neighbor India passed and implemented laws for safe NIR exposure, particularly from mobile phones and towers, as specified by the ICNIPR guidelines, but in 2012, they changed their minds and adopted one-tenth (1/10) level limits, as recommended by the ICNIPR. They can "inspect, monitor, and take immediate action" against any vendor or company that breaks the rules, which can result in a monetary penalty of ten lakh rupees. Any citizen can request that the radiation from a nearby mobile tower be measured for a fee of Rs. 4000. The success or failure of any Rules and Regulations is determined by how they are implemented. Enacting similar law could be an effective step for mitigating the increasing electromagnetic radiation and associated pollutions. When the phone is not in use, we should keep it away from our bodies because it continues to emit radiation by sending at least one pulse per minute to communicate with the base station. It is also beneficial to use a cell phone with a lower Specific Absorption Rate (SAR) (less than 1W/Kg). SAR is a measure of how dangerous something is. The lower the SAR, the less dangerous it is. Ideally, a phone with a SAR value of 0.2-0.8W/Kg should be chosen. People are opting for optical fiber solutions, low-power transmitting antennas, in-building solutions, and repeaters all over the world. Shielding solutions such as window shielding film, shielding curtain, Radiation, shield unit, and others can be used in areas where radiation levels are high. Many countries' judicial authorities have ordered mobile phone companies to remove their towers from residential areas, according to evidence. (For instance, France, Germany, Greece, India, and other countries.) Bangladesh's judiciary could play a crucial role in ensuring a radiation-free society in the future.

## Conclusion

Dhaka will have a population of 25 million people by 2025, according to the Far Eastern Economic Review. With the growing number of mobile phone users, more BTS are being built to support network growth in various public areas throughout the city. Unlike mobile phones, BTS emits radiation continuously and is more powerful at close range. We cannot conclude that the health effects are a direct result of the BTS based on the findings of various studies. However, numerous studies have discovered a link between EMW radiation from BTS and health risks, which should not be ignored and should be considered a public health concern. Because it is invisible and only becomes noticeable after a long period of exposure, electromagnetic pollution from cell phone towers and other sources is worse than smoking. Even if people are aware of the radiation risk, they may not be able to move away from the tower if it is built near their office or residential building. The government should enact proper regulations to mitigate pollution with relevant penal provisions to create a deterrent effect in society. If we failed to stop the electromagnetic radiation timely, there probably will be no place on Earth without pollution. In other words, as Biswas says, “We human beings have done a wonderful job of contaminating the environment around us.”

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