

# Mobile antenna bases, environmental impact & health *Institutional framework in the EU and its implementation in Greece*

**Nikolaos A. Doukas**

PhD Student  
Geography Department,  
Harokopio University of Athens  
Kallithea-Attica, Greece.

**Abstract-** This research aimed to determine the application level of European Union legislations, regarding to mobile phone antenna bases, due to their effects on the environment & health, in Greece. An in-depth investigation was carried out at European, national and local level, both legislative, judicial, executive and applicative level, regarding the effects on public health and the environment of mobile antenna bases. It analyzes European and Greek legislations, combined with judicial decisions and compares the development of political and economic interests in relation to citizens' health and environmental protection. A mixed method approach was used, the research combines qualitative analysis with European and Greek courts and parliaments and quantitative analysis with questionnaires to technical and structural services directors in Greece. It examines cases of adequacy and applicability of the current legislations in Greece.

**Index Terms-** Mobile antenna bases, Public Health, Environmental Protection, legislation, sustainable implementation, Greece.

## I. INTRODUCTION

Cell phones send and receive radio signals despite of the number of cellular base stations with microwave antennas. These are usually mounted on towers, poles or buildings located in residential areas, which are usually no more than eight (8) to thirteen (13) kilometers apart.

Since the advent of mobile phones and their spread among ordinary users, various concerns about possible health effects have arisen, which have triggered relevant public debate as well as scientific studies. Eighteen (18) studies have been conducted regarding the link between cell phones and brain cancer. A review of these studies finds that cell phone use for ten (10) years or more "conveys a consistent pattern of increased risk for auditory neuroma and glioma." [1]

As known, electromagnetic energy consists of waves propagating in space. Like any kind of radiation, radio waves vary in strength inversely proportional to the square of the distance. [2] As stated on the official website of Hellenic Telecommunications and Post Commission (EETT), the competent authority for the supervision of electronic communications, the power density incident on a surface (measured in watts/m<sup>2</sup>), at a distance of one hundred (100) meters from the radiation source, is ten thousand (10,000) times lower compared to the power density generated at a distance of one (1) meter from the source. [3] Typical locations where the public is exposed are at ground level, in buildings under antennas, and in buildings with antennas mounted on masts or other buildings. [4]

Studies conducted at low intensities exposure to Electromagnetic Radiation (H/R), comparable to those received by the user at distances between sixty (60) and one hundred fifty (150) meters from a mobile phone antenna base, reported an increase in human neuroblastoma cells [5], a change in immune functions in mice after exposure to H/R at a daily power of 0.001 mW/cm<sup>2</sup> [6], decrease in reproductive function in mice exposed to H/R at a density of 0.000168-0.001053 mW/cm<sup>2</sup>, increase in testosterone levels in rats exposed to H/R 0.018-0.025 W/kg and many more cases of effects on the brain and DNA [7][8][9]. [10]

It is worthy of note that is difficult to apply in studies, biological effects arise from radiation, which may be "dose" dependent, suggesting long-term cumulative effects [11][12][13]. [14]

The effects of "electromagnetic pollution" on nature have been poorly studied. [15][16] It is worth mentioning as an indication that studies have shown damage to the nervous system of animals [17], disruption of the sleep rhythm [18][19], hormonal imbalances, weakness, exhaustion and deterioration of fluttering in birds [20], a negative effect of the growth of trees, an increase in the production of resin in pine trees [21], a decrease in life time of the plants, as well as morphological and developmental abnormalities [22][23].

The infrastructure of mobile networks and the implementation of mobile services are key factors for the development of European economies. In order to ensure national coverage, mobile telephony companies must install mobile base

stations in most of the country territory so that every citizen can use their mobile services. Base stations are the ones that provide geographical coverage for the proper and precise operation of their mobile services. [24]  
Further, the introduction of new mobile services (4G, 5G) requires new base stations with new technology. Thus, mobile carriers require new licenses to install these new base stations.

## II. STATEMENT OF THE PROBLEM

The legal terms that the operators have to face in order to grant them the license for installation of antenna bases are different between European countries. These procedures are defined at different government levels. However, it is necessary to meet the general requirements related to regional or national legislation, despite mostly the local authority, namely the Municipality, is the key point for completing the process.[24]

In the European Union such specifications and safety limits in radiation emission are regulated particularly strictly and based on the precautionary principle. According to this principle, when an activity creates threats to the environment or human health, preventive measures must be taken, even if the cause-effect relationship has not been fully scientifically established. [25][26]

The installation of mobile phone antennas and their operation is governed by an institutional framework, whether they are installed in residential areas or not. It is necessary to present the current legal framework in Greece in a concise and evolutionary way, in order to realize how complex and multifaceted it is, but also to make an attempt to demonstrate whether it is sufficiently functional and easily applicable.

Indicatively, are mentioned the competent Greek authorities that take part in the management of the installation of antenna bases, in the last few years only.

Ministry of Transport and Communications, Ministry of Development, Ministry of Environment-Planning and Public Works, Ministry of Health and Welfare (By Greek Law 2801/2000)

Hellenic Atomic Energy Commission, Ministry of Environment, Energy and Climate Change, Ministry of Health and Social Solidarity, Ministry of Transport Infrastructure and Networks, National Telecommunications & Posts Commission (Greek law 4070/2012)

creation of a nationwide telemetric network for continuous measurement and recording of electromagnetic radiation levels, i.e. the "National Observatory of Electromagnetic Fields" (Greek law 4053/2012)

managed by the Ministry of Rural Development and Food, with the decision of the Regional Governor and the opinion of the Land and Dispute Resolution Committee (Greek law 4061/2012)

Ministry of Finance, Office of Public Property for the installation of land stations (mobile telephone antennas) and the imposition of sanctions, where required (Law 4062/2012).

Ministry of Environment and Energy, Ministry of Health and Digital Governance (Greek Law 4635/2019).

Local Government (Greek law 4280/2014).

There are numerous cases where courts, decided that the antenna base installation was illegal, based on the so-called Declaration of Adherence to the Standard Environmental Commitments (SEDs).[27]

The Ombudsman, therefore, pointed out that the omission of the law for the registration of existing base stations caused confusion and circumvention of the provisions, with the installation of mobile telephone antennas that did not meet the conditions. In many cases, it was found that the antennas had been placed without the necessary approval of the competent urban planning service or in excess of the approval granted. An additional problem was the fact that the relevant permits were often granted by the competent urban planning agency, without investigating in the first place, the legality of the building, in which the installation took place.

Serious problems were occurred in the possibility of removing the illegally installed antennas, as the Building Services, while maintaining the competence of ascertaining the arbitrary constructions, but the Decentralized Commands acquired the competence of carrying out the demolitions. However, the Decentralized Administrations did not have the required infrastructure to carry out the specific demolitions. [27]

It thus becomes clear that, following the final confirmation, the issuance of any new demolition decision for the same structure is not required and is not foreseen. At the same time, the demolition decision that may be issued by the building services has an affirmative character and lacks enforceability, while it is not a precondition for the execution of the demolition. [28][29]

Therefore, issues relating to the legitimate interest of citizens are raised and in the aspect of a general protection, not only by ensuring the health of citizens but also the integrity of the natural environment, which is obviously intertwined with the quality of life of any It is living within a society that claims the title of favorable.

## III. METHOD ANALYSIS

A mixed method approach was used, the research combines qualitative analysis with European and Greek courts and parliaments and quantitative analysis with questionnaires.

A. qualitative analysis:

The diagram of Figure 1 reveals an increasing trend throughout Europe, regarding the time required to grant base stations. The situation seems to be constantly aggravated in Ireland, Belgium, Italy and France. Only in Greece there is some improvement, although much more authorities are employed in the country for the approval of the relevant licenses. [24]

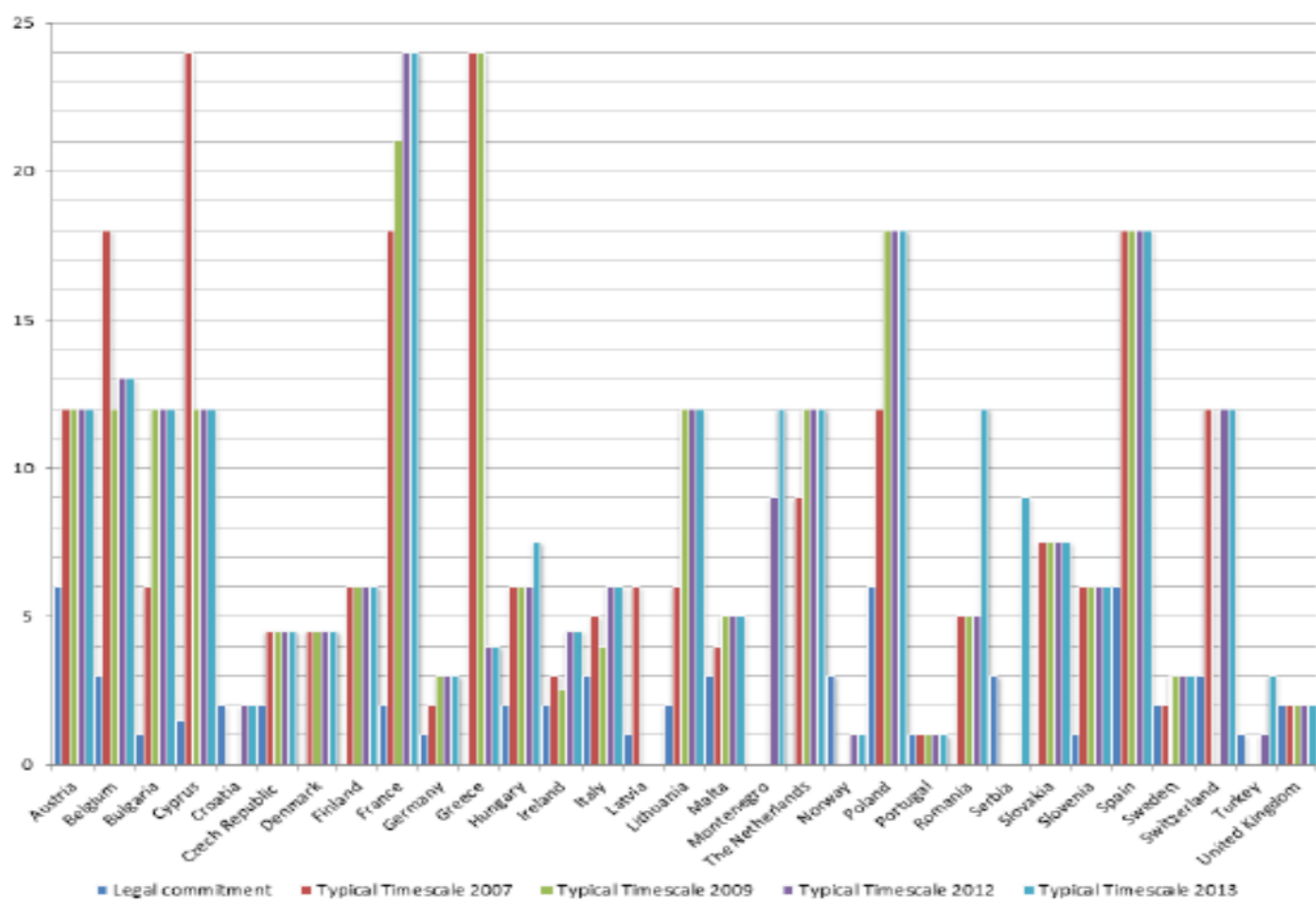


Figure 1. Comparison between legal requirements and formal timetables on the granting of a basis for installation (in months) (Source: Groupe Special Mobile Association. (2013). GSMA. Base Station Planning Permission in Europe.)

In Germany, the procedure of licensing mobile bases is controlled by local authorities and Bnetza [30] (6 weeks). In Belgium, the regional administrations control the procedure of licensing mobile bases. To issue the relevant license, they need to comply with the rules of all authorities and especially local, regional and federal [24] (130-400 days). In France, the Municipalities and the French Frequency Authority (Agency Nationale des Fréquences - Anfr) control the procedure of licensing the mobile bases (1-5 months). [24] In Italy, the procedure of licensing mobile bases is controlled by municipalities (design issues), and have general responsibility for the approval process. At the same time, the Regional Environmental Authority provides advice to the Municipality on the impact of the electromagnetic field on each base station (90 days). [24] In Greece, the National Telecommunications Regulatory Authority (NTRA) controls and regulate the procedure of licensing the bases. Applications are submitted throughout an electronic system. These competent authorities / organizations are: a) the Civil Aviation Authority, regarding the safety of the air transport, b) the Greek Atomic Energy Commission, regarding exposure limits, c) the competent Prefectural Office, regarding the environmental commitment for most stations base or environmental impact study, d) NTRA, regarding frequencies, e) the local forestry authority, regarding the agricultural stations and f) the local building authority, regarding building approval rather than licensing (4-24 months). [24]

#### B. quantitative analysis:

Questionnaire is a quantitative method of scientific research, on the basis of which the researcher can collect data and information in order to investigate the subject matter of his research [31].

For the needs of this research and given the effort to investigate the existence of licensed or non-licensed mobile telephony antennas in Greece, the number of such antennas per square kilometer at the level of Municipalities and

Regions, the time of their placement approval and the possibility of demolition of unlicensed antennas, the method of the questionnaire was chosen as the most suitable for the collection of measurable results and the extraction of safe conclusions.

A questionnaire was therefore drawn up, addressed to the Heads of Technical and Structural Services of the Municipalities and Regions of Greece, in which the participant in the survey was asked to select a response from the parties and thus express his personal knowledge of the subject under investigation. Among the questions the most important could be said to be the ones asking the participant about the number of antennas per square kilometer, the placement of new antennas, the existence of unlicensed antennas, the demolition of unlicensed antennas, the adequacy or not of the legislation, the imposition of sanctions and possible excesses of limits by the providers related to the antenna’s mobile telephony services.

Out of 332 municipalities, 133 replied to the questionnaire and out of 13 Regions, 5 replied.

In particular, Figure 2 shows that 68.6% of the Heads of Municipalities and Regions that were questioned, consider that there is a lack of compliance with the urban planning requirements as regards the installation of antennas, while only 13.7% of them respond that there is no lack of compliance with urban planning requirements and 11.9% do not know - do not answer.

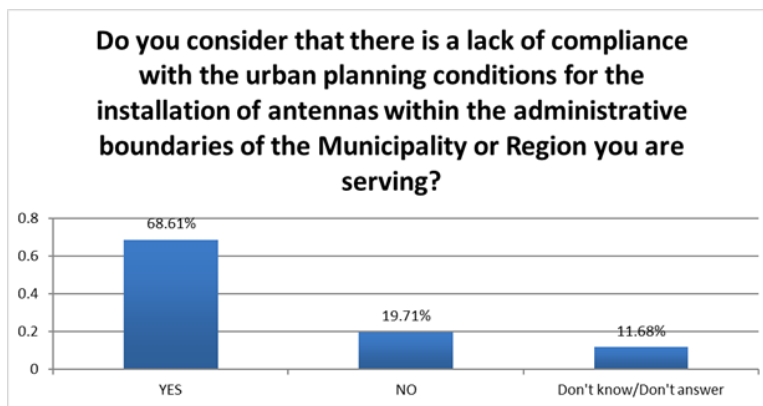


Figure 2. Lack of compliance with the urban planning conditions for the installation of antennas within the administrative boundaries of the Municipality or Region. Source: 2023 questionnaire results

Of these 68.6% who responded positively to the lack of compliance with the urban planning requirements in relation to the installation of antennas, 73.4% of them claimed that there were unlicensed antennas (Fig. 3), while 68.1% said that there were complaints about unlicensed antennas (Fig. 4) and 74.5% admitted that there was no investigation performed at any level (Fig. 5).

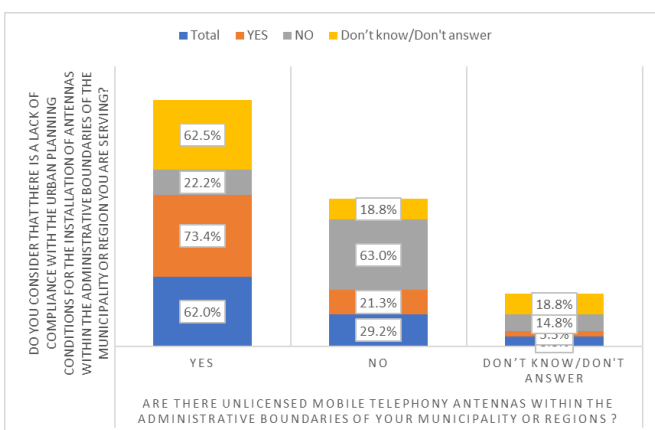


Figure 3. Lack of compliance with the urban planning conditions for the installation of antennas within the administrative boundaries of the municipality or region compared with the unlicensed antennas. Source: 2023 questionnaire results

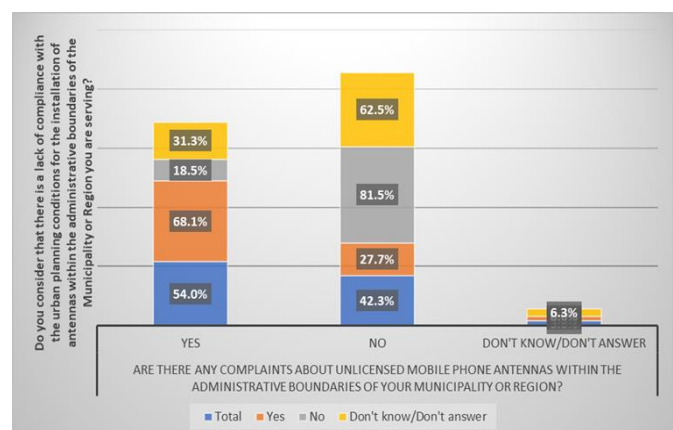


Figure 4. Lack of compliance with the urban planning conditions for the installation of antennas within the administrative boundaries of the Municipality or Region compared with the complaints about unlicensed mobile antennas. Source: 2023 questionnaire results

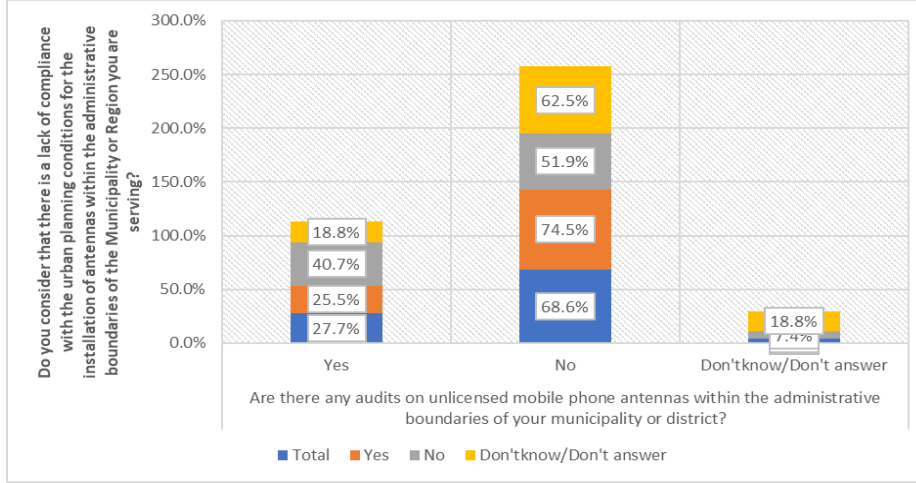


Figure 5. Lack of compliance with the urban planning conditions for the installation of antennas within the administrative boundaries of the Municipality or Region compared with the audit on unlicensed mobile antennas. Source: 2023 questionnaire results

It has already been reported that 96.8% of the Heads of State declare that there are cases of environmental degradation (Fig. 6), with 52.1% judging how they are managed as moderate and 35.1% as non-existent (Fig. 6). Regarding the color and morphological adjustment of the antennas, to comply with the morphological characteristics of the surrounding environment, 94.7% stated that it is not applicable (Fig. 7).

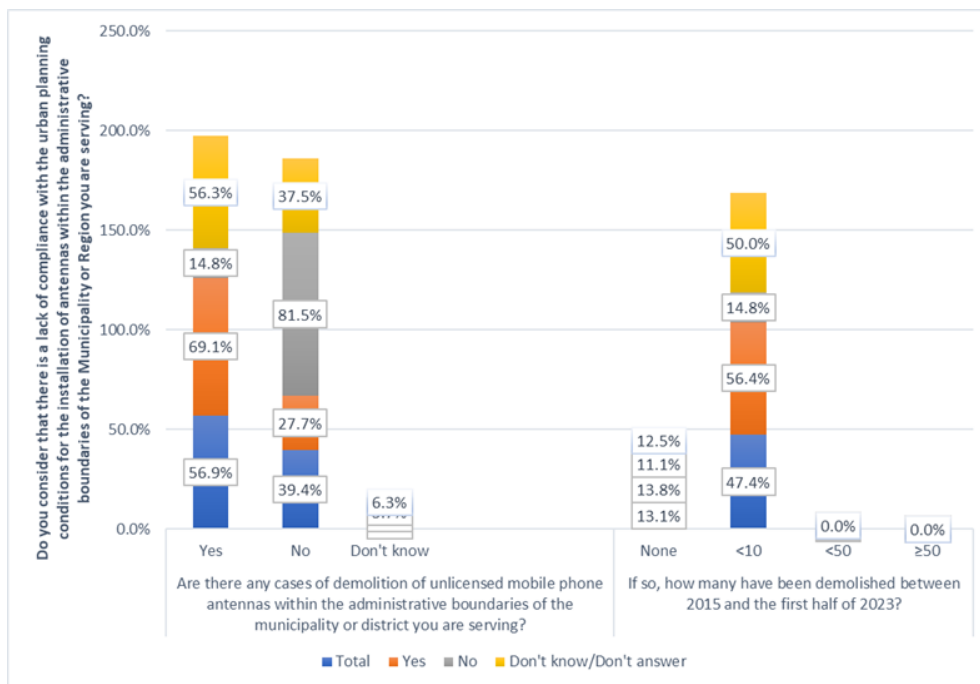


Figure 6. Lack of compliance with the urban planning conditions for the installation of antennas within the administrative boundaries of the Municipality or Region compared with demolition of unlicensed mobile phone antennas & how many have been demolished between 2015 and the first half of 2023. Source: 2023 questionnaire results

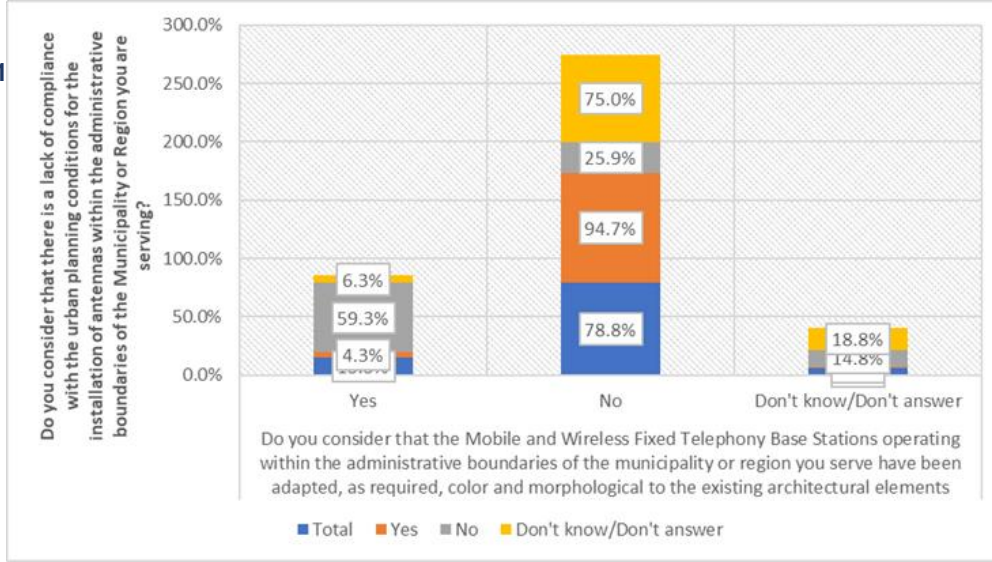


Figure 7. Lack of compliance with the urban planning conditions for the installation of antennas within the administrative boundaries of the Municipality or Region compared with Mobile and Wireless Fixed Telephony Base Stations operating within the administrative boundaries of the municipality or region you serve have been adapted, as required, color and morphological to the existing architectural elements of the buildings? Source: 2023 questionnaire results

Figure 8, shows that 57.4% of respondents stated that the most common cause of non-demolition of unauthorized antennas is the failure to cooperate with the authorities involved, although there have been cases of demolition (69.1%). Furthermore, Figure 9 shows that the vast majority do not know how an antenna is handled after its demolition (92.6%) or who is responsible for its management when it ceases to operate (79.8%). In the case of infringements and penalties, it is found that just over half of them do not know-do not answer, and only 36.2% reply that sanctions have been imposed by the National Telecommunications and Postal Commission (Fig. 10). As regards withdrawals of licenses, the excess of permissible emitted electromagnetic radiation or any complaints by citizens about antenna noise, the vast majority responds negatively or do not know-do not answer (Fig. 10).

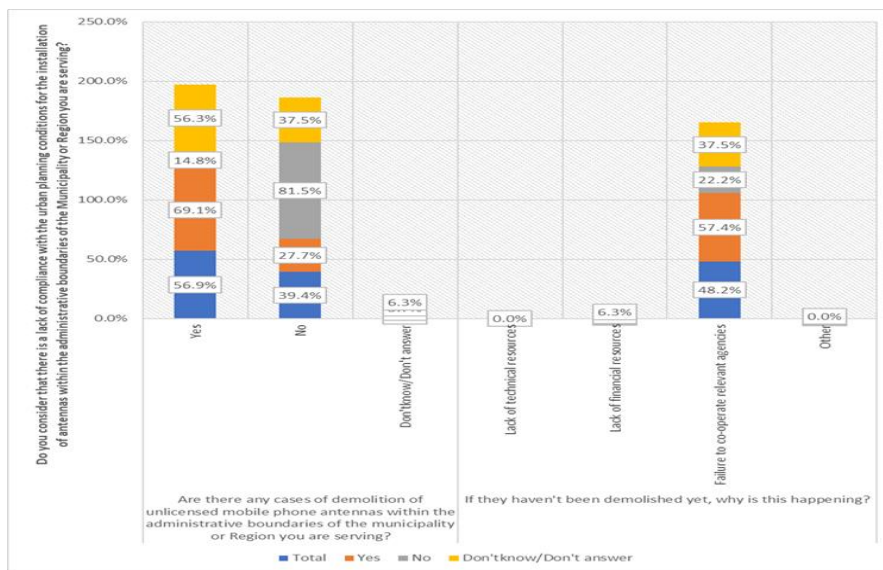


Figure 8. Lack of compliance with the urban planning conditions for the installation of antennas within the administrative boundaries of the Municipality or Region compared with demolition of unlicensed mobile phone antennas & if they haven't been demolished yet, why is this happening? Source: 2023 questionnaire results

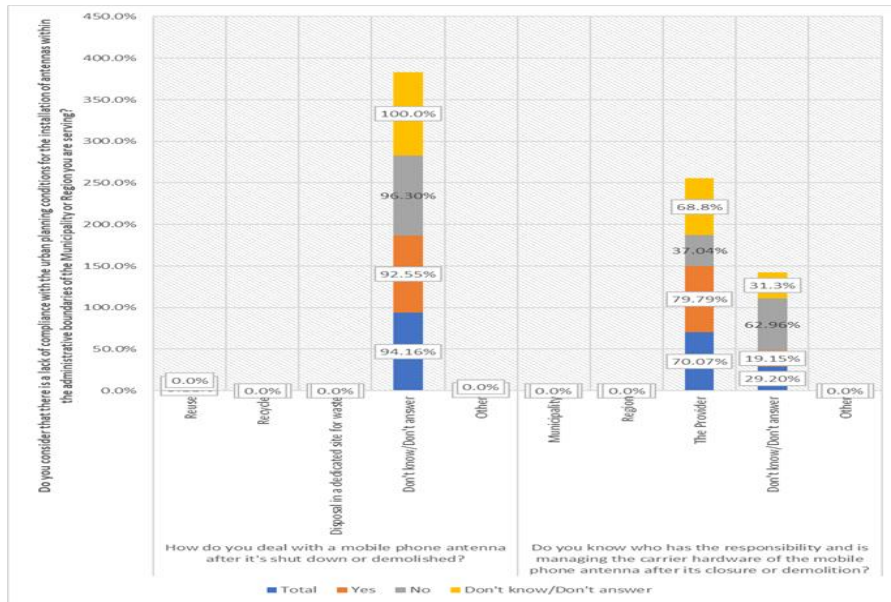


Figure 9. Lack of compliance with the urban planning conditions for the installation of antennas within the administrative boundaries of the Municipality or Region compared with how do you deal with a mobile phone antenna after it's shut down or demolished & do you know who has the responsibility and is managing the carrier hardware of the mobile phone antenna after its closure or demolition? Source: 2023 questionnaire results

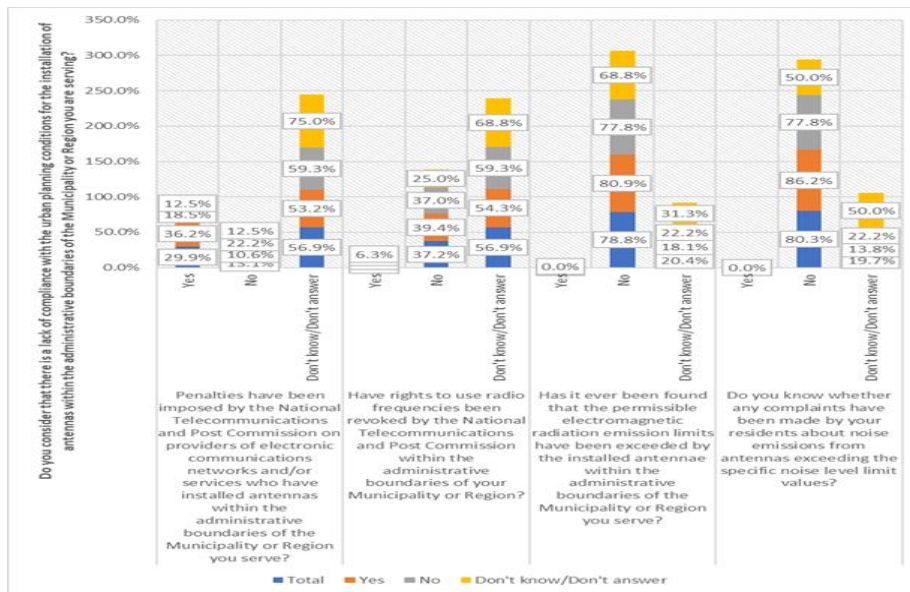
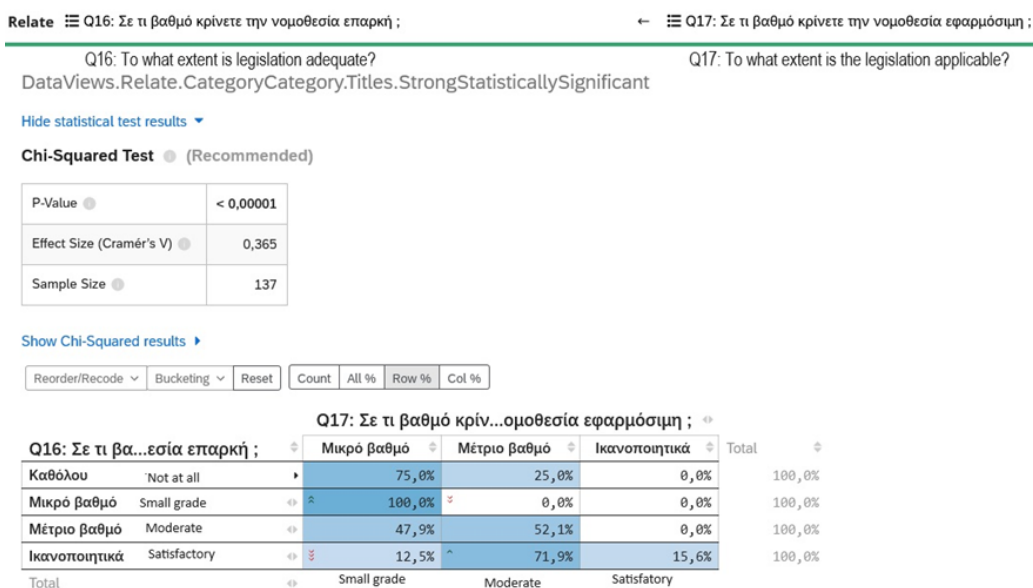


Figure 10. Lack of compliance with the urban planning conditions for the installation of antennas within the administrative boundaries of the Municipality or Region compared with Penalties have been imposed by the National Telecommunications and Post Commission on providers of electronic communications networks and/or services who have installed antennas & have rights to use radio frequencies been revoked by the National Telecommunications and Post Commission & has it ever been found that the permissible electromagnetic radiation emission limits have been exceeded by the installed antennas & do you know whether any complaints have been made by your residents about noise emissions from antennas exceeding the specific noise level limit values? Source: 2023 questionnaire results

It is interesting to notice the P-Value=0,00001 between the answers given on adequacy and applicability of the legislation (Fig. 11). 75% of those who replied that the legislation is not at all adequate said that the legislation is also applicable to a small extent and 25% to a moderate degree. All of them who replied that the legislation is sufficient to a small extent, also described it as applicable to a small extent. 47.9% of those who reported the legislation as modest declared it applicable to a small extent and 52.1% to a moderate degree. Finally, 71.9% of those who said that it was satisfactory also said that it was only modest implementation and just 15.6% described it as satisfactorily workable. It

should be noted that almost all respondents said that the legislation was applicable to a smaller extent than the adequate.

Figure 11. Statistical analysis: P-Value=0,00001 between the answers given on adequacy and applicability of the legislation Source: 2023 questionnaire results / processing statistical data via Qualtrics XM program



#### IV. CONCLUSION-DISCUSSION

Therefore, it is clear that investigation-inspections and controls relating to licensed and unlicensed mobile telephony antennas must be stepped up as to whether they fulfill the conditions for their installation and operation, both at an early and later stage and at regular intervals. Local authorities must play a key role in safeguarding the health of citizens and protecting the residential and general environment. There must also be explicit and highly regulated communication and cooperation between local authorities in the demolition, handling and management of mobile telephony antennas in the cessation of operation event, and not been left only in the actions of the providers. At the same time, it must be ensured that local authorities are actively involved in the demolition and management of mobile telephony antennas. Local government has to make major interventions and make substantial proposals regarding the completeness and applicability of the relevant legislation in practice, since it is them who are called to make use of it at the first stage and in the field. In any case, the constant information and vigilance of local government bodies is absolutely necessary and not negotiable, if the municipalities and regions wish to meet the needs for which they were created.

Innovation and modernization on the field of networks must also enter the environment, not in the sense of a standard technical approach but of a meaningful diffusion and convergence of environmental expectations and with the ultimate goal of substantial development.

#### REFERENCES:

- Hamilton, T. (2008). Listening to Cell Phone Warnings: Researchers Working Overtime to Find Out If the Greatest Tool of Business is Causing Brain Cancer in Those Who Use It Constantly. Διαθέσιμο σε: [https://www.thestar.com/business/2008/05/31/listening\\_to\\_cellphone\\_warnings.html](https://www.thestar.com/business/2008/05/31/listening_to_cellphone_warnings.html) (Ανακτήθηκε 21 Ιουνίου, 2017).
- Zamanian, A. & Hardiman, C. (2005). Electromagnetic Radiation and Human Health: A Review of Sources and Effects. High Frequency Electronics. 16-26.
- Broumas, A. (2016). Law and Technology Legal Services. Available at: <https://lawandtech.eu/2016/01/03/antennas-Authorization/> (Retrieved March 14, 2018). Broumas, A. (2016). Δίκαιο και τεχνολογία Νομικές Υπηρεσίες. Διαθέσιμο σε: <https://lawandtech.eu/2016/01/03/antennas-authorisation/> (Ανακτήθηκε 14 Μαρτίου, 2018).
- Kwan-Hoong Ng. (2003). Non-Ionizing Radiations –Sources, Biological Effects, Emissions and Exposures. Electromagnetic Fields and Our Health. 1-16.
- Dutta, S.K., Subramoniam, A., Ghosh, B., and Parshad, R. (1984). Microwave radiation-induced calcium ion efflux from human neuroblastoma cells in culture. Bioelectromagnetics. 5(1): 71–78.



6. Fesenko, E.E., Makar, V.R., Novoselova, E.G., and Sadovnikov, V.B. (1999). Microwaves and cellular immunity. I. Effect of whole-body microwave irradiation on tumor necrosis factor production in mouse cells. *Bioelectrochem. Bioenerg.* 49(1): 29–35.
7. Persson, B.R.R., Salford, L.G., and Brun, A. (1997). Blood–brain barrier permeability in rats exposed to electromagnetic fields used in wireless communication. *Wirel. Netw.* 3(6): 455–461.,
8. Phillips, J.L., Ivaschuk, O., Ishida-Jones, T., Jones, R.A., Campbell- Beachler, M., and Haggren, W. (1998). DNA damage in Molt-4 T-lymphoblastoid cells exposed to cellular telephone radiofrequency fields in vitro. *Bioelectrochem. Bioenerg.* 45(1):103–110,
9. Belyaev, I.Y., Markova, E., Hillert, L., Malmgren, L.O., and Persson, B.R. (2009). Microwaves from UMTS/GSM mobile phones induce long-lasting inhibition of 53BP1/gamma-H2AX DNA repair foci in human lymphocytes. *Bioelectromagnetics*, 30(2): 129–141.
10. Levitt, B. & Lai, H. (2010). Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays. *Environ. Rev.* 18: 369-395.
11. Galeev, A.L. (2000). The effects of microwave radiation from mobile telephones on humans and animals, *Neurosci. Behav. Physiol.* 30: 187–194.
12. Lai, H. (2005). Biological effects of radiofrequency electromagnetic field, in: *Encyclopaedia of Biomaterials and Biomedical Engineering*.
13. Adey, W.R. (1997). Bioeffects of mobile communications fields: possible mechanisms for cumulative dose. in: N. Kuster, Q. Balzano, J.C. Lin, (Eds.), *Mobile communications safety*. New York: Chapman & Hall.
14. Balmori, A. (2009). Electromagnetic pollution from phone masts. *Effectsonwildlife. Pathophysiology.* 16: 191-199.
15. Balmori, A. & Hallberg, O. (2007). The urban decline of the house sparrow (*Passer domesticus*): a possible link with electromagnetic radiation, *Electromagn. Biol. Med.* 26: 141–151.
16. Magras, I.N. & Xenos, T.D. (1997). Radiation-induced changes in the prenatal development of mice, *Bioelectromagnetics.* 18: 455–461.
17. Beasond, R.C. & Semm, P. ( 2002). Responses of neurons to an amplitude modulated microwave stimulus, *Neurosci. Lett.* 33: 175–178.
18. Mann, K. & Roschke, J. (1996). Effects of pulsed high-frequency electromagnetic fields on human sleep, *Neuropsychobiology.* 33: 41–47.
19. Marino, A.A., Nilsen, E., Frilot, C. (2003). Nonlinear changes in brain electrical activity due to cell phone radiation, *Bioelectromagnetics.* 24: 339–346.
20. Balmori, A. (2003). Aves y telefonía móvil. Resultados preliminares de los efectos de las ondas electromagnéticas sobre la fauna urbana, *El ecologista.* 36: 40–42.
21. Selga, T. & Selga, M. (1996). Response of *Pinus Sylvestris* L. needles to electromagnetic fields. Cytological and ultra structural aspects, *Sci. Total Environ.* 180: 65–73.
22. Magone, I. (1996). The effect of electromagnetic radiation from the Skruna Radio Location Station on *Spirodelapolyrhiza* (L.) Schleiden cultures, *Sci. Total Environ.* 180: 75–80,
23. Sandu, D., Goiceanu, C., Ispas, A., Creanga, I., Miclaus, S., Creanga, D.E. ( 2005). A preliminary study on ultra high frequency electromagnetic fields effect on black locust chlorophylls, *Acta Biol. Hung.* 56: 109–117.
24. Groupe Speciale Mobile Association. (2013). *GSMA. Base Station Planning Permission In Europe*.
25. Broumas, A. (2016). Δίκαιο και τεχνολογία Νομικές Υπηρεσίες. Διαθέσιμο σε: <https://lawandtech.eu/2016/01/03/antennas-authorization/> (Ανακτήθηκε 14 Μαρτίου, 2018).
26. European Directive 2002/20/EC. Ευρωπαϊκή Οδηγία 2002/20/EK
27. Ombudsman (2016). Ombudsman's views on the licensing process of mobile antenna. Athens: Assistant Ombudsman. ΣΥΝΗΓΟΡΟΣ ΤΟΥ ΠΟΛΙΤΗ. (2016). Απόψεις του Συνηγόρου του Πολίτη για τη διαδικασία αδειοδότησης των κεραιών κινητής τηλεφωνίας. Αθήνα: Βοηθός Συνήγορος του Πολίτη.
28. Ombudsman (2013). Demolition processes of finally judged arbitrary constructions. Athens: No. 1300.2/40543/2013. ΣΥΝΗΓΟΡΟΣ ΤΟΥ ΠΟΛΙΤΗ. (2013). Διαδικασίες κατεδάφισης τελεσιδικώς κριθεισών αυθαιρέτων κατασκευών. Αθήνα: Αριθ. Πρωτ. 1300.2/40543/2013.
29. Spiliotopoulos E. (2010). *Manual of Administrative Law. Volume 2. Version 13th, p.107.* Σπηλιωτόπουλος Ε. (2010). *Εγχειρίδιο Διοικητικού Δικαίου. Τόμος 2. Έκδοση 13η, σελ.107.*
30. German Regulatory Authority for Industries: Telecommunications, Postal Services, Railways, Electricity. Γερμανική ρυθμιστική αρχή για τις βιομηχανίες: τηλεπικοινωνίες, ταχυδρομικές υπηρεσίες, σιδηρόδρομοι, ηλεκτρική ενέργεια.
31. Tsiplitaris F.A., Babalis K.Th : Ten examples of scientific research methodology, from theory to practice, Publications, Path, 2006, p. 80 Τσιπλητάρης Φ. Α., Μπαμπάλης Κ.Θ. : Δέκα Παραδείγματα Μεθοδολογίας Επιστημονικής Έρευνας, Από τη Θεωρία στην Πράξη, Εκδόσεις, Ατραπός, 2006, σελ.80