

SUSTAINABLE CITIES VERSUS RADIO BASE STATIONS (RBS) INSTALLATION: SETBACK OF PORTO ALEGRE/BRAZIL PUBLIC POLICY.

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Abstract

In Porto Alegre/Brazil, the Municipal Law nº 8.896/2002, which set limits of exposure to non-ionizing radiation more protective than the levels established by the Federal Law, became a reference to other municipalities in the creation of RBS public policies, in line with the precautionary principle. In this scenario, an exploratory and descriptive research of qualitative nature was performed choosing as case study the municipal law of RBS in Porto Alegre, from the perspective of Sustainable Development. The results showed that the Municipal Law nº 8.896/2002 can be considered an innovative regulatory mark for Sustainability Development. Nevertheless, there was a flexibilization of legislation, which occurred in 2014, especially in the aspect of health. In addition, there was a repeal of Law nº 8.896/2002 at the end of 2018, resulting in an environmental setback in the political discussion about the possible adverse effects caused by electromagnetic pollution in the cities.

Keywords: sustainable development, public policy, cities, radio base stations.

CIDADES SUSTENTÁVEIS VERSUS INSTALAÇÃO DE ESTAÇÕES RÁDIO BASE (ERB): RETROCESSOS NA POLÍTICA PÚBLICA DE PORTO ALEGRE/BRASIL

Resumo

Em Porto Alegre/Brasil, a Lei Municipal nº 8.896/2002, que estabeleceu limites de exposição à radiação não ionizante mais protetores que os níveis estabelecidos pela Lei Federal, tornou-se referência para outros municípios na criação políticas públicas de ERB, de acordo com o princípio da precaução. Nesse cenário, foi realizada uma pesquisa exploratória e descritiva de natureza qualitativa, escolhendo como estudo de caso a lei municipal de ERB em Porto Alegre, na perspectiva do Desenvolvimento Sustentável. Os resultados mostraram que a Lei Municipal nº 8.896/2002 pode ser considerada um marco regulatório inovador para o Desenvolvimento Sustentável. No entanto, houve uma flexibilização da legislação, que ocorreu em 2014, principalmente no aspecto da saúde. Além disso, houve a revogação da Lei nº 8.896/2002 no final de 2018, resultando em um retrocesso ambiental na discussão política dos possíveis efeitos adversos causados pela poluição eletromagnética nas cidades.

Palavras-chave: desenvolvimento sustentável, políticas públicas, cidades; estações rádio base.

CIUDADES SOSTENIBLES VERSUS INSTALACIÓN DE ESTACIONES RADIO BASE (ERB): RETROCESOS EN LAS POLÍTICAS PÚBLICAS DE PORTO ALEGRE/BRASIL

Resumen

En Porto Alegre/Brasil, la Ley Municipal nº 8.896/2002, que estableció límites de protección contra la radiación no ionizante más protectores que los niveles establecidos por la Ley Federal, se convirtió en una referencia para otros municipios en la creación de políticas públicas para ERB, de acuerdo con el principio de precaución. En este escenario, se realizó una investigación cualitativa exploratoria y descriptiva, eligiendo como caso de estudio la ley municipal de ERB en Porto Alegre, en la perspectiva del Desarrollo Sostenible. Los resultados mostraron que la Ley Municipal 8.896/2002 puede considerarse un marco regulador innovador para el Desarrollo Sostenible. Pero, hubo una flexibilización de la legislación, que ocurrió en 2014, especialmente en el aspecto de la salud. Además, Ley 8.896/2002 fue revocada a fines de 2018, lo que resultó en un retroceso ambiental en la discusión política de los posibles efectos adversos causados por la polución electromagnética en las ciudades.

Palabras Clave: desarrollo sostenible, políticas públicas, ciudades, estaciones radio base.

INTRODUCTION

A current global threat that can affect the public health in the urban environment is the result of the scientific technology widely employed by Telecommunications Companies in the last decades: the pollution caused by non-ionizing electromagnetic radiation, specifically in the present research, the radiofrequencies transmitted by Radio Base Stations (RBS).

Although technological advances in mobile telephony are providing benefits for communication between individuals, new threats to the environment and public health can arise from this technology. In this case, technologically desirable solutions in the Telecommunications Sector (antenna installation in cities) turn out to be potentially paradoxical as they can have both positive and negative effects. On the one hand, the increase in signal coverage by operators may satisfy the desires of users seeking a wireless mobile telecommunications service (human needs). On the other hand, research on the effects on human health, arising from exposure to radio frequencies emitted by the RBS, question their total safety (scientific technological risks).

In parallel, the environmental issue is often approached in the present through the concept of Sustainable Development. In the situation of radiofrequency exposure emitted by RBS in the urban environment, local authorities can create public policies for this issue, controlling the possible impacts to human health, in accordance with the assumptions of Sustainable Development of cities.

This is the case of RBS public policies in Porto Alegre, which adopted, in an initial decision on the subject, more restrictive limits of exposure to non-ionizing radiation in places considered "sensitive" in the city (those where people remain for most of the time, such as apartment buildings, nurseries, schools, hospital rooms, geriatric institutions, workplaces, among others), which are ten times lower than the standards established by the national telecommunications agency in the country - Resolution 303/2002 of Agência Nacional de Telecomunicações (ANATEL) - and Federal Law nº 11.934/2009, both based on the safety limits of the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

The theme of the present research is inserted in the context of uncertainties of technoscience in contemporary society and the unpredictability of its consequences for public health and the urban environment. This research aims to analyze the case of the municipal legislation of RBS in Porto Alegre / Brazil, from the perspective of Sustainable Development and the precautionary principle, examining the background and current situation of Law 8896/2002. The article is structured in five sections. This introduction (1), followed by the literature review (2), discusses topics about the RBS, risks and their relationship with the dimensions of Sustainable Development in the cities. The third and fourth sections detail the method (3) and the research results (4). In the last section, the final considerations are presented (5).

RISKS, RBS AND SUSTAINABLE DEVELOPMENT IN THE CITIES

Beck (2011) emphasizes in modernity an overlapping of the problems and distributive conflicts of society with the problems and conflicts originating in the production, definition and distribution of scientifically-technologically produced risks.

The growth of the telecommunications sector in the country may expand the sources of electromagnetic fields in urban environments. According to Tejo (2004), the earth's natural electromagnetic environment does not include significant components of radiofrequency or microwave radiation. As there is an ongoing explosion of radio broadcasting and television stations, radiotelephone networks, cordless and cellular phones, there has been a power density on the global

environment about million times higher than the electromagnetic density from tropical storms and solar energy (Tejo, 2004).

This electromagnetic pollution caused by man can directly impact public health. Since 1996, through the project called International EMF (Electromagnetic Field) Project, the World Health Organization (WHO) has evaluated scientific evidence of possible health effects of electromagnetic fields in response to public concern and as part of its commitment to protecting health. This project encourages research to fill important knowledge gaps and facilitate the development of internationally acceptable standards by limiting exposure to electromagnetic fields (World Health Organization [WHO], 2016). In 2011, WHO and the International Agency for Research on Cancer (IARC) classified in 2011 the radiofrequency electromagnetic field as "possibly carcinogenic" to humans, based on an increased risk for glioma, a malignant type of brain cancer, associated with wireless phone use (International Agency for Research on Cancer [IARC], 2011).

A comprehensive report by an international working group to assess the scientific evidence of health impacts from electromagnetic radiation found that current limits on public health protection are inadequate and that new limits are needed (Bioinitiative Report, 2007). After five years, the report reinforced the scientific evidence of health risk. Compared to 2007, harmful effects on human health were found at significantly lower levels of chronic exposure to low intensity electromagnetic radiation, as did the range of possible adverse health effects from these field (Bioinitiative Report, 2012).

Epidemiological studies show evidence that populations around RBS presents a higher probability to develop cancer than non-exposed populations. The result of the study in Naila, Germany, shows that the risk of new cancer cases is three times higher among patients who lived during the last ten years (1994 to 2004) within 400 meters of RBS compared to who lived further away (Eger, Hagen, Lucas, Vogel, & Voit, 2004). The result of the work done in Netanya, Israel, indicates that the risk of new cancer cases is 4.15 times higher among patients who lived within 350 meters of the RBS, compared with those who lived farther away (Wolf & Wolf, 2004). In line with the results found internationally, research conducted in Brazil also showed the existence of spatial correlation between cases of death from neoplasms and the locations of the RBS in the city of Belo Horizonte (Dode, 2010).

Due to the physiological effects resulting from exposure to non-ionizing electromagnetic fields, according to Tejo (2004), it is necessary to create rules and regulations that provide protection of the general public and professionals exposed to these fields. According to Dode and Leão (2004), the International Non-Ionizing Radiation Committee was the first International Committee formed in 1977, which dealt with ionizing radiation issues. This Committee became ICNIRP, responsible for studies on human exposure to non-ionizing radiation, as well as for the creation of guidelines and guidance for scientific research (Dode & Leão, 2004).

According to the ICNIRP guidelines, maximum safety limits for human exposure to electromagnetic fields were established. However, such upper limits have been established for acute and short-term effects only (International Commission on Non-Ionizing Radiation Protection [ICNIRP], 1998). In 1999, ANATEL adopted the same limits stipulated by ICNIRP for exposure of the general population and for occupational exposure to time-varying electric and magnetic fields in the 9 kHz to 300 GHz radiofrequency range (Agência Nacional de Telecomunicações [ANATEL], 1999), becoming in a Resolution in 2002 (ANATEL, 2002). In 2009, Federal Law nº 11.934, which provides for limits on human exposure to electric, magnetic and electromagnetic fields, again followed ICNIRP guidelines recommended by WHO (Brasil, 2009).

Salles and Fernández (2004) highlight in the following countries rules that partly consider non-thermal effects such as: Switzerland, Italy, Luxembourg, Belgium, Russia, China, etc. Also, by

adopting the Precautionary Principle, several countries such as Australia, Belgium, Italy, Liechtenstein, Luxembourg, New Zealand, Russia and Switzerland, as well as the cities of Salzburg, Austria, and Toronto, Canada, can be cited, which have their human exposure limits to radio frequencies below the guidelines based solely on human tissue heating (Dode & Leão, 2004).

Many countries accept ICNIRP guidelines but apply precautionary approaches or other philosophies to implement more conservative boundaries than proposed by WHO, ICNIRP and other international organizations (Israel, Ivanova, Zaryabova, & Shalamanova, 2015). Accordingly, the Parliamentary Assembly recommends that the member states of the Council of Europe, in its Resolution 1815 of 27 May 2011, reconsider the scientific basis of the current standards for exposure to electromagnetic fields established by ICNIRP, which have serious limitations, and the application of the "as low as reasonably achievable" (ALARA) principle - covering both thermal, athermal and biological effects of electromagnetic emissions (Parliamentary Assembly, 2011).

In the case of Porto Alegre, Municipal Law n° 8.896/2002 followed the same pattern used in Switzerland. It should be noted that these values are ten times lower than the levels established by ICNIRP / ANATEL for electric field intensity: 6 V/m values set by Law n° 8896/2002 in "sensitive sites" versus 60 V/m established by ICNIRP / ANATEL. According to art. 1 of Municipal Law n° 8.896/2002, its purpose was to regulate the environmental licensing, at the municipal level, of the RBS and related equipment authorized and approved, respectively, by ANATEL, observing the health standards, environmental rules and the principle of precaution by establishing applicable urban standards in accordance with local interest. By adopting stricter limits of exposure to electromagnetic fields in "sensitive sites" in the city (those where people stay longer, such as apartment buildings, kindergartens, schools, hospital and geriatric rooms, workplaces, among others), the Municipality of Porto Alegre was based on the precautionary principle (Porto Alegre, 2002).

In the building of the consciousness of Sustainable Development, numerous international conferences were fundamental in creating official policies for environmental protection. Contained in the notorious report *Our Future Common*, also known as *Brundtland Report*, it's important to remember the classic definition of Sustainable Development as one that meets the needs of the present generations without compromising the ability of future generations to meet their own needs (United Nations, 1987). Products of United Nations Conference on the Human Environment (1972) and the United Nations Conference on Environment and Development (1992), the Stockholm (United Nations, 1972) and Rio (United Nations, 1992) Declarations emphasize the responsibility of National States to protect and improve the environment, with strong repercussions on the principles of Environmental and International Law. Principle 3 of the Rio Declaration establishes the right to development, so that should be exercised allowing equitably meet environmental and development needs of present and future generations (United Nations, 1992). The Rio Declaration also addresses several key issues for the promotion of Sustainable Development, such as the precautionary principle (United Nations, 1992).

In September 2015, the United Nations unanimously approved the document *Transforming Our World: The 2030 Agenda for Sustainable Development* - with its 17 new global objectives and 169 goals. In the current agenda, with post 2015 goals, there is a clear conviction about the urgent need to take bold and transformative steps to put the world on a sustainable and resilient path. (United Nations, 2015). In Objective 11, the issue of cities is addressed, which must become inclusive, secure, resilient and sustainable (United Nations, 2015). In 2016, *Habitat III - United Nations Conference on Housing and Sustainable Urban Development* - took place in Quito, Ecuador, with the creation of a *New Urban Agenda*, which reaffirms the global commitment to sustainable urban development as a decisive step towards achieving Sustainable Development in an integrated and coordinated manner at global, regional, national, subnational and local levels, with the participation of all relevant actors (United Nations, 2016).

From this scenario, the theme of Sustainable Development has been gaining increasingly importance in the construction of public policies that face the diverse complex and uncertain problems existing in the cities, also taking into account the precautionary principle.

METHOD

This research aims to analyze the case of the municipal legislation of RBS in Porto Alegre / Brazil, from the perspective of Sustainable Development and the precautionary principle, examining the background and current situation of Law 8896/2002. Thus, an exploratory and descriptive research with a qualitative approach was chosen, and for this, a case study was carried out. According to Flick (2009), the pluralization of the spheres of life requires a new sensitivity for the empirical study of the questions and, in this direction, qualitative research is of particular relevance to the study of social relations.

Thus, the unit of analysis of the present research is the Municipality of Porto Alegre, analyzing the public policy of RBS - Municipal Law nº 8.896/2002 and its guidelines. The case of Porto Alegre was chosen by non-probabilistic sampling, considering its relevance, because in Brazil, the municipality was a pioneer in the elaboration of protectionist legislation for the issue of RBS, becoming a reference for other Brazilian municipalities. For Yin (2015), the case study as a research effort contributes singularly to the understanding of individual, organizational, social, and political phenomena. After the definition of the unit of analysis of the case study, we started to collect data. Yin (2015) states that there are several ways to collect data in a case study, and can combine more than one type of collection in the same study, which contributes to the breadth and validity of the research construct. Therefore, in this research, observations and interviews were made to obtain primary data, as well as secondary data collected from documentary sources.

The data collection began in 2014, identifying the various social actors in the process of implementing RBS public policies in Porto Alegre. At this stage of the research, the observation and data collection were used in the public hearing about Executive Law Project nº 57/2013, on June 26, 2014, in order to get items to research questions.

In order to describe the process of implementation of RBS public policies in Porto Alegre, a semi-structured interview with the social actors involved in the discussion of Municipal Law nº 8.896/2002, which took place in 2016. As the interviews happened with the main social actors identified in the Public Hearing, new social actors were indicated by the interviewees as possible sources of data for the research. This is the snowball technique, in which the respondents are located with the use of reference network (Cooper & Schindler, 2011). In total, 16 interviews were conducted to analyze the data of this research.

In addition, legislative-documentary sources were explored, related to Municipal Law Nº 8.896/2002, collected in 2016 and 2018. Legislation of RBS was also investigated at the state and federal levels, as well as judicial decisions. In addition, local newspapers documents were consulted in Zero Hora (private access) and Correio do Povo (public access) media collections, as well as on-line and printed documents donated by social actors. This method of research was important to verify the positioning of cellular companies in the Judiciary and in the Media, as well as their view on Municipal Law nº 8.896/02, because it was not possible to conduct interviews with cell phone companies and with the syndicate that represents mobile service in the Country.

After collecting this material, data processing and analysis were performed. The analysis and interpretation of the data was performed according to Sustainable Development and the precautionary principle, through the technique of content analysis. For this, all interviews were transcribed, as well as treated the observations and documents, in order to allow a better operationalization of the data for analysis. According to Schreier (2013), content analysis seeks to

describe the meaning of qualitative data by assigning categories to the material collected in a coding frame that presents all aspects of description and interpretation. Thus, for this research, the codes of analysis were derived from the Sustainable Development and the precautionary principle (theory driven). From the analysis of these theoretical elements, were distinguished three political moments of relevance in public policies of RBS in Porto Alegre.

RESULTS

The Municipal Law nº 8.896/2002, in its article 1, evidences the intention of the Public Power to systematize the rule for installation of RBS in accordance with the precautionary principle (Porto Alegre, 2002). By adopting the same levels of maximum radiofrequencies exposure levels established by Switzerland and below recommended international standards and norms, Porto Alegre created a Law, precisely based on the precautionary principle, in order to protect the health of the population. This aspect of legislation was emphasized by Councilors at the time in reports:

Councilman Juarez Pinheiro (...) yesterday highlighted the sanction, by Mayor João Verle, of law 8.896, which provides for the installation and operation of mobile phone base stations (...). Juarez, author of Law 8.463 / 00, which underpinned the project, emphasizes that the sanctioned law is probably the most advanced in Latin America in the sector: "It aims, in a preventive way, to protect the health of the population by decreasing the maximum power density limit of the antennas a hundredfold," he said. The law adopts the levels used in Switzerland (...). The councilman recalled that there were two seminars in Porto Alegre on the subject. (Correio do Povo, 2002).

According to a representative of the Executive, interviewed during the period by the media, the new legislation aimed to reduce the limit of the radiation emitted by the antennas, lowering the maximum level to reassure the population and make telecommunications possible (Correio do Povo, 2001). In fact, there was a very high fear in the population regarding the health impacts of radiofrequencies. This is precisely what is stated in a document from the Porto Alegre neighborhood associations' movement (Movimento das Associações de Bairros de Porto Alegre) to inform the population about cell towers and cities in 2002:

(...) The INTENSE use of mobile phones has been a matter of concern among the population of several countries. (...) In 1996, WHO launched the international project that seeks to provide a worldwide response to health hazards due to exposure to electromagnetic fields. Therefore, the fear is not just imagination of some crazy residents of Porto Alegre! It exists worldwide, so much so that many countries for many years have been using power density hundreds of times lower than those adopted by the United States or Brazil. ... WHY THE FEAR? Cell phone antennas emit high frequency electromagnetic waves. Electromagnetic radiation has detrimental health effects causing diseases such as cataracts, glaucoma, cardiovascular problems, reproductive organ disorders, allergies, headaches, insomnia, cancer (especially leukemia in children). (Movimento das Associações de Bairros de Porto Alegre, 2002)

The fear of the community associations of the municipality is clear because of the lack of legislation to protect the citizen from the health risks arising from the radiation emitted by the RBS. From the mobilization of the community movement regarding the various impacts of the RBS on the urban environment, the Government was provoked to react in order to make the cell phone service viable and protect the health of the population of Porto Alegre, supported by the precautionary principle.

Thus, in the first political moment, the Municipal Law nº 8.896/2002 states that places considered as sensitive, characterized as those where people stay for a longer period of time, such as apartment buildings, kindergartens, schools, hospital rooms and geriatric institutions, workplaces, among others, should comply with the limits set out in the Swiss Standard, which follows the precepts of the precautionary principle. Another device created was to limit the installation of antennas within 50 meters of some particular properties (real estate boundary where hospitals, elementary,

middle and preschool schools, day care centers, surgical and geriatric clinics and health centers), as well as prevent the construction of RBS at these sites.

As such, Porto Alegre became a national reference in the creation of public policies of RBS, according to the former Councilor (1996-2004), E10, author of Law nº 8.896/2002: "Porto Alegre was the only city in the country at that time that was taking the lead in this issue, which was absolutely new in the national debate, and established levels that were comparable to those used in Switzerland." (E10, 2016).

In this process of drafting Municipal Law nº 8.896/2002, E10 highlights the fundamental role of scientists from the Federal University of Rio Grande do Sul - Universidade Federal do Rio Grande do Sul (UFRGS), who assisted in the technical foundation of the legislation. According to E3 (2016), a researcher at UFRGS, the University was requested by a city cell phone company to measure the electromagnetic field levels of its antennas. The findings are instructive because they show the compatibility between the precautionary principle, with the adoption of lower radiation limits emitted by the antennas, and the economic viability of providing cellular service in the city:

(...) We measured, at the time, the field level in some more or less typical antennas (...) and by making these measurements, in very few places we were able to measure levels that were one-twentieth of the ICNIRP limit or Federal Law, which is much later. The Federal Law is from 2009 (...) and I am telling you about 1998. (...) what puts these measurements on us? What we had with these measurements was a certain guarantee that we could adopt one of the principles within the law, the precautionary principle, that the permitted levels are as low as technically possible. So at the time, in Porto Alegre, with the geography of Porto Alegre, with the orography of Porto Alegre, with the network of the time of Porto Alegre, it was possible to make or propose a law with a limit, for example, if not 20 times lower in electric field level, 10 times lower than ICNIRP recommendation. (E3, 2016)

Therefore, the values of Municipal Law nº 8.896/2002 can be perfectly met in Porto Alegre, without harming the city's cellular service. What is evident in this discussion about radiofrequency emission limits adopted in the city of Porto Alegre is the real possibility of meeting the strictest standards, stipulated in the Swiss norms and based on the precautionary principle, without compromising the provision of the service of telecommunications in the city. This opinion was peacefully expressed by the various experts interviewed in this research - E1, UFRGS Professor, E9, ANATEL Engineer and E7, Municipal Environmental Secretariat - Secretaria Municipal do Meio Ambiente - Engineer:

(...)Technology today is a very developed technology, so one can receive the very low level signal. (...) For example, the people in the laboratory have been measuring and usually complying with the Porto Alegre Law, that Law of 2002, and Switzerland's own standards. Therefore, this is no problem. (E1, 2016)

(...) they meet, they follow these levels, all the measurements we made they meet. (...)Even using the rules of Porto Alegre, which is a tenth of the ICNIRP rules, all the measurements we made in Porto Alegre, all of them were well below that. It is actually a somewhat natural effect. With the best antenna distribution, the provider will always operate or try to operate with as little signal as possible. It is best for plant management to operate with as little signal as possible (E9, 2016)

(...) we do a sampling. In the samples the values are low, so much so that just to give you an idea, the values (...) the normal is 0.4 / 0.5 V/m, it is the levels that we get, that so in the city. (E7, 2016)

The Promoter of Justice, E6, also endorses this view, reporting on a recent expertise held in RBS company Telet S.A.:

In Telet's action, they paid an expertise (...) they wanted it because they wanted a skill, they paid it. The expertise cost approximately R\$ 700.000,00 and the court expert measured the radiation on all Telet antennas, according to the best technique. If I am not mistaken only

one antenna gave above the norm and yet probably not because of the antenna itself, but because it was near a bright billboard. (E6, 2016)

In a report by Zero Hora, in 2013, we can examine the position of companies regarding the Porto Alegre legislation, as well as their intention to change it:

In 2012, representatives of the operators asked the Special Committee of the 2014 World Cup to bring to Porto Alegre a request for revision of the so-called Antenna Law. The current legislation, which, according to the companies, would be the main cause of unsigned areas in Porto Alegre, imposes a minimum distance of five meters from the antenna to the nearest property boundary and 50 meters from hospitals, educational institutions, kindergartens, clinics and health centers. From the request of the operators in September, was presented the Project Law nº 3.279/2011, proposing the repeal of the current Antenna Law. Considered too lenient towards companies, the proposal also did not escape criticism – this time the advocates of strict standards against electromagnetic emissions. Result: Substitute Project Law nº 1, while seeking a compromise between the two currents, also did not please both sides. (Zero Hora, 2013)

It is confirmed, in this report, the dissatisfaction of the operators with some devices created by Law nº 8.896/2002. However, there is no contrary reference from the companies regarding the lower radiation limits, which were stipulated in the Porto Alegre legislation. Certainly, some respondents cited the dissatisfaction of companies, in particular, with the provision of the Law, which establishes the minimum horizontal distance of 50 meters between RBS and hospitals, elementary, middle and preschool schools, day care centers, surgical clinics and geriatric centers and health centers. About the health effects of this device, the Professor at the Catholic University of Rio de Janeiro – Universidade Católica do Rio de Janeiro (PUC-Rio), E13, expressed his inefficiency:

(...) This is such nonsense. (...) Once a judge in Porto Alegre asked the following: (...) how do you think the antenna had to be in relation to the school? I said it like this: in the school yard. The antenna tower had to be in the courtyard because (...) near the antenna is where it has the least radiation. (...) Because the radiation does not go down, it goes sideways. (...) No matter how far, you have to measure the radiation level. ... Distance is a fictitious thing, and numbers for these distances, in my modest opinion, make no sense at all (...) although energy decreases with distance. (E13, 2016)

The UFRGS Professor, E1, observes two aspects in this issue:

(...) are two essential things: it is the exposure level and this level is obviously connected at a distance, because the electromagnetic field from the antenna that emits it, the farther away it is decreasing. In fact, it decreases with the inverse square of the distance. When the distance, for example, bending the power density decays four times. (...) Therefore, that is why the legislators at that time put it. (...) we at the University were insisting more on electric field levels and power density, but lawmakers felt that the issue of distance too should come up in the law. So that is why 50 meters, but again, this has to be checked and examined along with the power levels, because it is not just the distance (E1, 2016)

In the above explanation of the experts, the electric field levels and power density are more relevant to the discussion of the Law, than the rule providing for a 50 meter exclusion zone. In the second political moment, after intense discussions in Porto Alegre in 2014, Executive Law Project nº 57/2013 was approved by the Capital City Council by 21 votes in favor and 4 against. Sanctioned by the Mayor of Porto Alegre, Law nº 11.685/2014 revoked precisely item III - art. 3º of Law nº 8.896/2002, which was the target of criticism by companies. Thus, there is no longer the 50-meter exclusion zone, considered by the operators as a barrier to the telecommunications service in the Municipality. Regarding the radiofrequency emission levels of the antennas, item I - art. 3 - has changed, replacing the concept of “sensitive sites” with “critical sites”, maintaining the more restrictive limits for “critical sites”, and ICNIRP and ANATEL limits for the others. The “critical sites” are the buildings of hospitals, clinics, schools, day care centers and long-term care nursing institutions located within 50 meters from the installation of RBS (Porto Alegre, 2014a).

With the approval of Law n° 11.685/2014, it should be noted the change in the nomenclature of "sensitive sites" to "critical locations". By the definition of "sensitive sites", homes and workplaces were also considered strongly susceptible to the effects of radiofrequencies, as people stay longer in these environments. In the justification for the approval of Amendment n°. 8 of Executive Law Project n° 57/2013, Councilman Claudio Janta was based on the subjective character of the definition, causing legal uncertainty to public servants responsible for environmental licensing, and to companies that intend to perform investments, as practically the entire urban territory would be classified as sensitive (Porto Alegre, 2014b).

In particular, as regards the change in item I - art. 3° - from the Municipal Law n° 8.896/2002, from the perception of the interviewed experts, it can be inferred that a cellular telephone system with low levels of radio frequency emissions is perfectly viable in all regions of the city, based on the precautionary principle, without prejudice to providing a telecommunications service of excellence to its users.

However, in the third political moment, under the mandate of the current municipal government, the Executive Complementary Executive Law Project n° 13/18 was proposed, which was approved at the end of 2018 by 22 votes to 5 in the Porto Alegre City Council, repealing the previous legislation (Law n° 8.896/2002 and Municipal Law n° 11685/2014), with the understanding that the Municipality would not have competence to legislate on the subject, in line with the position of the telecommunications operators and ANATEL (Porto Alegre, 2018). According to the new law, the license will be given to "express" form in the receipt of the act by the City of necessary documents, based the information provided by applicants (Technical Responsibility or technical Responsibility registration and authorization issued by ANATEL), except for stations located in permanent preservation areas or property tumbled or inventoried, which is open administrative records for examination of the application within 30 days by responsible agencies. In addition, the maximum radiofrequency emission limit in any location in Porto Alegre is that established by Federal Law 11.934/2009, which takes into account the limits of human exposure to electric, magnetic and electromagnetic fields by ICNIRP.

Mention should be made of the precautionary limit of 0.614 V/m suggested by the Bioinitiative Report study group, which is lower than the 6 V/m values set by Law n° 8896/2002 for "critical sites" and 60 V/m established for the ICNIRP / ANATEL. According to the 2012 report, the precautionary limit of 0.614 V/m should be adopted for cumulative radio frequency exposure. This value reflects a prudent public health response, according to current science, to radio frequency (environment) exposure where people live, work and go to school. (Bioinitiative Report, 2012). The invocation of precautionary principle is essential in the current social context, since, in modern society, the emergence of scientific-technological risks, as pointed out by Beck (2011), is increasingly frequent.

Certainly, in the genesis of the Municipal Law n° 8896/2002, the intention of the legislator was to protect the entire population, following health rules and, using the precautionary principle, to establish lower limits of radiofrequency emission, in line with the Sustainable Development in the city. However, the changes in 2014 and the repeal of the Law n° 8896/2002 in 2018 removed this originally intended protective ideal, contrary to the ALARA principle already recommended for Council of Europe countries.

CONCLUSION

The expansion of mobile telephony, in a modern society characterized by technical and scientific risks and uncertainty about its consequences for public health, raised in the population of Porto

Alegre, at the beginning of the millennium, a great clamor to build public policies of RBS in the local level, becoming a reference for many municipalities in the country.

From the research conducted it became clear that the radiofrequency exposure limits adopted in Porto Alegre and based on the Swiss Standard, in accordance with the precautionary principle, are perfectly viable to be used by the Telecommunications Sector in the city, without any prejudice to providing quality service to its customers. With respect to the 50 meter exclusion zones, this device, which was pointed out as one of the main complaints of mobile operators for the installation of antennas in the Porto Alegre legislation, was revoked in 2014, and the electric field and density levels of power proved to be more relevant to the discussion of the Law.

However, changes in the laws of Porto Alegre occurred in 2014 away from the ideal protective originally sought, since the limits based on the Standard Switzerland restricted themselves to "critical sites", excluding residences and workplace. In addition, the Municipal Law n° 8896/2002 was repealed in 2018, with only the limits established by Federal Law, in accordance with the limits of ICNIRP, and in a simplified licensing process. Thus, there has been no advance towards even more protective levels for all regions of the city, resulting in an environmental setback in the discussion of the possible negative effects caused by electromagnetic pollution in the city. Thus, there has been no advance towards even more protective levels for all regions of the city, resulting in an environmental setback in the political discussion of the possible negative effects caused by electromagnetic pollution in the city.

In the discussion about the installation of RBS in the Municipality, the Municipal Law n° 8.896/2002 can be considered an innovative regulatory mark for Sustainability Development of the city, avoiding many losses for the population as it harmonizes more stringent standards without hindering the operation of the mobile phone system in Porto Alegre. However, changes in Municipal Law n° 8.896/2002, which occurred in 2014, and its repeal in 2018, resulted in an environmental setback in the political discussion on the possible adverse effects caused by electromagnetic pollution, against the precautionary principle, with negative implications for Sustainable Development of the city.

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