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Analysis of the environmental impact caused by the activation of the train's audible warning signal at level crossings in urban areas

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Análise do impacto ambiental ocasionado pelo acionamento do sinal sonoro do trem nas passagens de nível em área urbana

RESUMO

Objetivo - Analisar os impactos ambientais (1ª e 2ª ordens) do acionamento da buzina de trem em passagens de nível urbanas sobre a qualidade de vida e saúde dos moradores.

Metodologia - Questionário online aplicado pelo Ministério Público (1.147 respondentes), tratamento em Excel com geocodificação residencial e elaboração de mapas temáticos no ArcGIS Pro.

Originalidade/relevância - Preenche lacuna sobre ruído ferroviário noturno em contextos urbanos brasileiros, relevante para políticas de mitigação sonora e saúde pública.

Resultados - 72% acordam com buzina (22h-6h); 62% com insônia; impactos incluem estresse, irritabilidade e redução de qualidade de vida, concentrados em áreas adjacentes à via.

Contribuições teóricas/metodológicas - Valida matriz de impactos de 1ª/2ª ordens (Sánchez, 2013) com abordagem geoespacial para ruído urbano.

Contribuições sociais e ambientais - Propõe medidas mitigadoras (barreiras acústicas, treinamento de condutores), promovendo sossego público e qualidade ambiental urbana.

PALAVRAS-CHAVE: Poluição sonora. Ruído ferroviário. Impacto ambiental.

Analysis of the environmental impact caused by the activation of the train's audible warning signal at level crossings in urban areas

ABSTRACT

Objective - Analyze environmental impacts (1st and 2nd order) caused by train horn activation at urban level crossings, particularly its effects on inhabitants' health and quality of life in areas near and distant from tracks.

Methodology - Online questionnaire with results processed in Excel spreadsheet, residential address geocoding, and preparation of environmental impact maps from horn activation.

Originality/relevance - Addresses noise pollution from urbanization and railway operations (especially nighttime horn sounding), contributing to scientific understanding of source-transmission-receiver dynamics in urban clinical studies.

Results - Identified 1st and 2nd order environmental impacts in anthropic environment from train passage discomfort, eliminating subjective value judgments through clear spatial mapping near and away from tracks.

Theoretical/methodological contributions - Validates source-path-receiver noise problem framework, demonstrating objective impact assessment eliminates inherent subjectivities in environmental studies.

Social and environmental contributions - Provides evidence base for urban railway noise mitigation policies, highlighting health consequences of nighttime operations on urban populations.

KEYWORDS: Noise pollution. Railway noise. Environmental health.

Análisis del impacto ambiental ocasionado por la activación de la bocina del tren en pasos a nivel urbanos

RESUMEN

Objetivo - Analizar impactos ambientales de 1ª y 2ª orden del accionamiento de la bocina del tren en pasos a nivel urbanos sobre la calidad de vida y salud de los residentes.

Metodología - Cuestionario online del Ministerio Público (1.147 respondedores), procesamiento en Excel con geocodificación residencial y mapas temáticos en ArcGIS Pro.

Originalidad/relevancia - Llena laguna sobre ruido ferroviario nocturno en contextos urbanos brasileños, relevante para políticas de mitigación sonora y salud pública.

Resultados - 72% despiertan con bocina (22h-6h); 62% insomnio; impactos incluyen estrés, irritabilidad y reducción de calidad de vida, concentrados cerca de las vías.

Contribuciones teóricas/metodológicas - Valida matriz de impactos de 1ª/2ª orden (Sánchez, 2013) con enfoque geoespacial al ruido urbano.

Contribuciones sociales y ambientales - Propone medidas mitigadoras (barreras acústicas, capacitación de conductores), promoviendo sosiego público y calidad ambiental urbana.

PALABRAS CLAVE: Contaminación sonora. Ruido ferroviario. Impacto ambiental.

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1 INTRODUCTION

Environmental pollution manifests itself in several anthropic actions. According to the National Environmental Policy (PNMA), that is, it can be defined as any activity that directly and indirectly damages environmental quality (BRAZIL, 1981). In this sense, noise pollution corresponds to a type of environmental degradation which affects human health and, consequently, reflects on the socioeconomic activities of the affected receptor, a damage caused by the noise to which the receptor is exposed (Souza Filho, 2012; Van Kamp; Davies, 2013; Freia; Mohlera; Rööslia, 2014; Silva, 2015; Zannin; Ferraz, 2016), reinforcing recent analyses on social inequalities in urban public management (Cardoso et al., 2025).

Noise emission levels are standardized by law, based on Conama's resolutions, such as Conama Resolution nº 01, of 08/03/1990, in which it is established that "the emission of noise, as a result of any industrial, commercial, social or recreational activities, including political propaganda, will obey the standards, criteria and guidelines established in this Resolution, in the interest of health and public peace" (Brazil, 1990, 1p.), in the Resolution nº 272, of 14/09/2000 that "provides the maximum noise limits for national and imported vehicles in acceleration, except motorcycles, scooters, mopeds and similar vehicles"(Brazil, 2000, 1p.), as well as by other normative documents of the Brazilian Association of Technical Standards (ABNT), such as NBR 10.152:2017(Corrected Version 2020) which "sets the noise levels compatible with acoustic comfort in various environments" (ABNT, 2017, 1p.); NBR 10. 151:2019 that in addition to "fixing the conditions required to evaluate the acceptability of noise in communities, regardless of the existence of complaints, also specifies a method for the measurement of noise, the application of corrections to the measured levels if the noise presents special characteristics and a comparison of the corrected levels with a criterion that takes into account several factors" (ABNT, 2019, 1p.). Besides these, others can be mentioned such as state and municipal legislation (São Carlos, 2020), seeking to regulate such emissions in their areas of administrative domain. Thus, the activities that generate any sound emission must comply with limiting standards in their operations. In this respect, the railway modal must meet legal requirements of allowed noise, given that it also contributes to noise discomfort in urban areas through which they have fixed route, especially at night hours, bearing in mind that through its structural feature there is no possibility of flexibilization.

Although total railway noise is classified as one of temporal aspect, such noise corresponds to a sum of others, when the train moves. Because it is a noise that starts and ends in a certain period (when the passage and activation of the horn at passage levels) has a transient and fluctuating characteristic, i.e., it has sound pressure levels and frequency spectrum that vary over time, periodically or randomly, as happens in car traffic on a particular public road (BISTAFA, 2018). In any case, the impact of acoustic pressure can cause discomfort to humans, influencing their quality of life (Zajarkiewicch, 2010; World Health Organization, 2011; Cowan, 2016; Bunn; Zannin, 2016). Although the legislation recommends the adoption of instruments to control noise pollution, such as environmental zoning (Brazil, 2002), it is necessary to have greater attention to the criteria used for licensing transportation activities. In this sense, the preliminary environmental impact assessment - EIA/RIMA, must describe the environmental impacts caused by the sound source in areas where the total railroad noise will

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be more expressive, such as at level crossings in urban areas, where warning sounds (horns) are activated (Vendramini; Paul, 2009; UIC, 2010; Seong et al., 2011) and in areas intended for maintenance of the trains. Described such impacts, mitigating measures (Sánchez, 2010; 2013) should be proposed in order to attenuate the discomfort caused, such as the installation of linings or acoustic barriers (Egan, 2007; Souza Filho, 2012; Oliveira Filho et al., 2018) and other elements that can serve as physical obstacles to the propagation of noise pollution generated by the passage of trains and horn activation.

Due to the noise impact the horn causes on people' health in urban areas (Oliveira, 2020), this study analyzed the environmental impacts generated by the train horn activation, especially at night, before and during the level crossings was raised. This was done in order to investigate whether the sounding of the horn causes any discomfort in the citizens' daily activities (1st order impact), affecting their quality of life, as well as the indirect impacts generated (2nd order impact), of secondary reaction, possibly with cumulative and/or synergistic interaction (Sánchez, 2010; 2013), determined by socio- environmental factors (VAN Kempen; Babisch, 2012), similar to challenges identified in metropolitan public transport (Ferreira et al., 2025).

Assessing potential environmental impacts on receivers of noise pollution can greatly contribute and help promote changes in the railway operational system, with the adoption of measures to minimize the nuisance related to noise. These changes can be made by reviewing and making technical adjustments with the railroad modal operators. One of these solutions, as already mentioned, is the erection of acoustic barriers that change the behavior of the sound wave, resulting in acoustic shadow regions that reduce sound levels (Daigle, 2010, Bistafa, 2018). Adopting these mitigating solutions for total railway noise, arising from environmental impact assessments, eliminates the subjectivities inherent in any value judgment (Sanches, 2013), given that they clearly point out solutions that do not cause damage to the railway infrastructure project, but rather introduce elements of environmental adequacy, providing a quality assessment to new studies proposed at the time of licensing renewal by the concessionaires (Brazil, 2006; Brazil, 2022; Ribeiro, 2009; Oliveira *et al.*, 2018), aligned with approaches to urban green infrastructures (Rigolo; Okimoto, 2025).

2 METHODOLOGY

In order to verify environmental impacts caused by train horn activation during the train's passage through urban areas, the case of the city of São Carlos-SP was chosen for analysis, after identifying the work of the local MP, who applied a questionnaire with 26 questions, to consult the population near the railway network about the global railway noise, in the period from 02/18/2022 to 03/13/2022, using *google forms* (Google, 2022).

The data resulting from this research were made available in an Excel spreadsheet and geocoded by the "Address" field, according to Stan (1990) and Eichelberger (1993), enabling the data's spatialization. This process was done using the Google[1] geocoding API, which proved to have the best results among the different tools tested.

[1] More details about Google's geocoding tool at https://mapsplatform.google.com/intl/pt-BR_ALL/products/#geocoding

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Of the proposed questions, six were selected and presented in Table 1. From these, we analyzed the environmental impacts of 1st and 2nd order (Sánchez, 2010; 2013), resulting from the level of sound pressure caused by the train horn before and during the level crossing in the urban area of the city, as well as the mitigation measures proposed for the railway noise, according to the precepts of Environmental Impact Assessment (AIA) (Sánchez; Gallardo, 2005; Oliveira; Medeiros, 2007; Sánchez; Morrison-Saunders, 2010; Sánchez, 2013).

Chart 1: Selected criteria

1st order Environmental Impacts	
1	• Do you hear noises from the railway line that passes through São Carlos in which location?
2	• How loud do you hear noises from the railway line that passes through São Carlos?
2nd order Environmental Impacts	
3	• Does the sound of the train horn wake you up during the night or early morning (in the period between 10 pm and 6 am)?
4	• Do you have trouble sleeping due to the noise generated by the train, especially the horn?
Environmental Impact Mitigation	
5	• Do you think there should be some action to prevent/change the horn activation?
6	• What measures do you think can be adopted to improve this situation?

Source: MP's questionnaire (Google Forms, 2022)

A total of 1,147 individuals were interviewed, of which, 87% could be accurately geocoded. As for the remaining cases, an approximate value was obtained for the position (2.6% based on the zip code and street address; 1% based only on the street address; and 9.8% based only on the zip code). After this process, the residential addresses were duly georeferenced in the ArcGis Pro software. From these data, maps for the analysis of the environmental impact generated by the horn activation were made, and discussed based on specialized literature and related legal norms.

3 RESULTS AND DISCUTION

Analyzing the impacts related to the operation of horns at level crossings, especially at night (10:00 pm to 6:00 am), it was possible to identify, within the questionnaire made available to the population, the first-order environmental impacts on the anthropic environment that occur when the train horn sounds at level crossings, considering the type of horn used and the operation period. Table 2 shows the analysis of the environmental impacts observed in the area (Directly Affected Area - ADA).

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Chart 2: Envirionmental Impacts analysis

Environment	1st Order Environmental Impact	ADA*
Anthropic	Increased physical and biochemical reaction of the individual as a result of nocturnal noise when the train horn is sounded before and during level crossing.(T); (M)	figure 1 (map)
	Increased sleep disturbance, characterized by difficulty, as a result of interrupted nighttime sleep when the train horn is blown before and during level crossing.(L); (R)	
	Increased concern about nighttime sleep as a result of it being interrupted when the train horn is blown before and during level crossings.(L);(R)	
	Decreased quality of life, as a result of the noise at night when the train horn blows before and during the level crossing. (M); (R)	
	2nd Order Environmental Impact	**ADA***
	Increased stress, as a consequence of insomnia, due to the interruption of night sleep when the train horn is blown before and during the level crossing.(M)/(L); (R)	figures 2 and 3 (maps)
	Increased irritability, anxiety, and bad feelings as a consequence of stress due to the interruption of night sleep when the train horn is blown before and during the level crossing. (M)/(L); (R)	
	Decreased quality of life, as a result of the noise at night when the train horn blows before and during the level crossing. (M); (R)	

Caption:

Negative Impact	Temporary (T)	Medium Term (M)	Long Term (L)	Reversible (R)	Irreversible (I)

* ADA = directly affected area

Source: Own authorship

Table 2 separates environmental impacts and indicates them on the ADA map. The highlighted negative impacts were mostly considered of medium (M) to long (L) duration and reversible (R), in view of the fact that, once the operational activity of horn activation was over, the impacts were minimized until they ceased in the anthropic environment.

The environmental impacts on the anthropic environment of 1st and 2nd orders are related to the disturbance of people's sleep, since the horn is blown from 10 pm to 6 am, exactly at the usual time of rest. Leive and Morisson (2020) consider sleep as a pillar of health, well-being, and quality of life for human beings, echoing municipal environmental mitigation plans (Bottoni et al., 2025). Sleep presents itself as a primary occupational and biological need (Tester; Foss, 2018; Wilcock; Hocking, 2015). Then, sleep provides a sense of health and well-being (Wilcock; Hocking, 2015), and humans cannot survive without sleep (Leive; Morisson, 2020).

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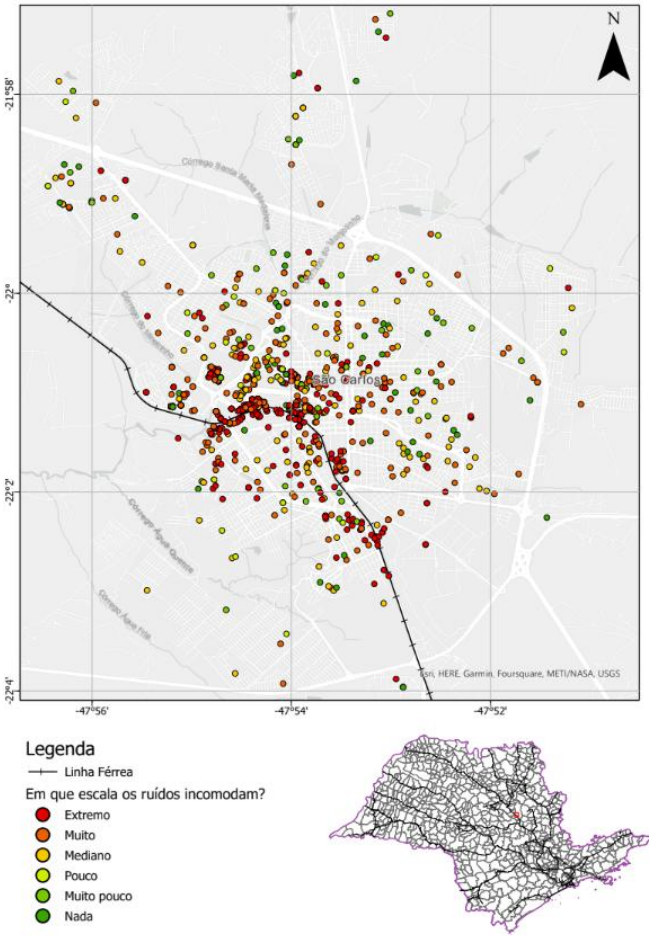
The Brazilian Federal Constitution mentions that "people must enjoy the right to a balanced environment, essential to a healthy quality of life. Once there is an adverse change in the characteristics of the environment, there is a degradation of environmental quality and, consequently, of pollution resulting from activities that directly or indirectly harm the health and welfare of the population (Brazil, 1981), as in the case studied, affecting the quality of life.

In the maps, considering the city of São Carlos-SP, the results were expressed in terms of the number of respondents, opting for a caption with colors indicating the level of discomfort of the global noise caused by the passage of the train (Figure 1); the disturbance of sleep with the sound signal (horn) (Figure 2), and the consequences of this disturbance by the horn (Figure 3).

Figure 1 shows that the nuisance caused by the overall noise with the passage of the train occurs from the moment the trains enter the urban perimeter, concentrating in areas near the roadway and even away from it. It is worth noting that spatial variations are possibly associated with the position of residences in relation to the horn triggering points. Apartments facing the opposite direction of the railway tend to suffer less impact than those directly facing the railway. And this effect can be extended to other spatial analyses presented in this study.

Figure 1: Annoyance generated by the overall noise when the train passes.



Source: own authorship

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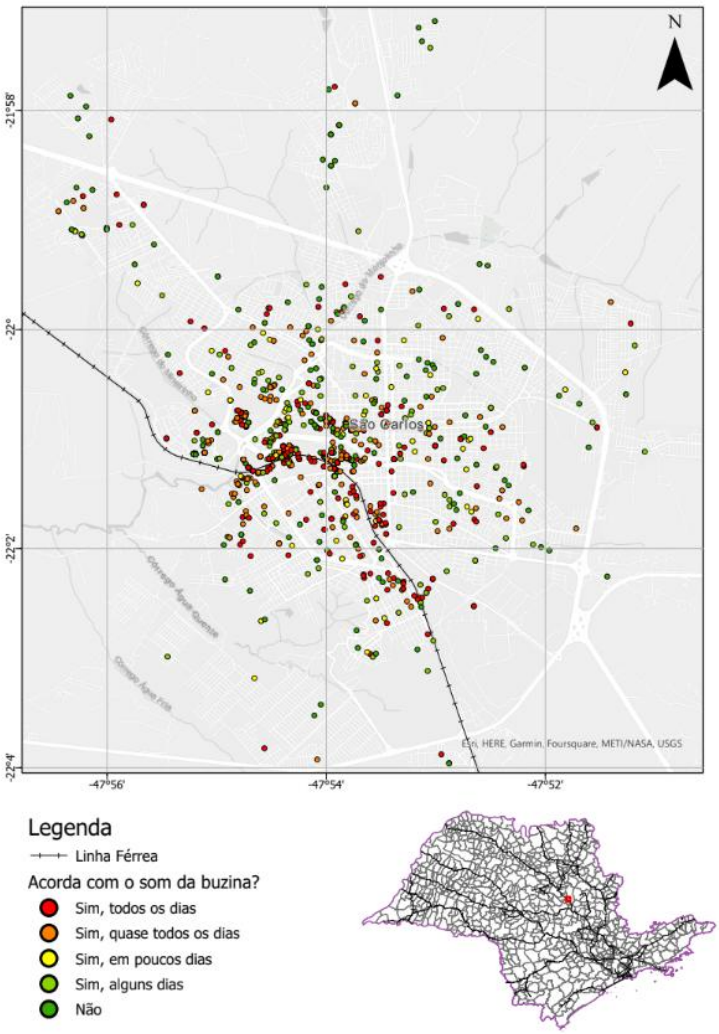
In the study, considering the surveyed municipality (São Carlos-SP), 81% of citizens hear the noise in their homes (46.5% are telecommuters, i.e., perform their professional work activities at home); 25.8% in their workplaces, i.e., in the organizations to which they provide services; and 4.5% hear the noise, in their study environment (school/university). The sum of this percentage indicates that the individuals interviewed do hear the global railway noise, and in more than one environment. As observed, the presence of this noise impacts their life routines in more than one moment in their day, causing some kind of socio-environmental damage. Such evidence is detected regarding the damage to health verified in the research, in which about 72% of the interviewees wake up to the noise produced by the railway at night, between 11pm and 6am, especially with the activation of the horn (Figure 2).

Figure 2: Sleep disturbance



Source: own authorship

As a consequence, 62.1% have difficulties in returning to sleep, i.e., they cannot

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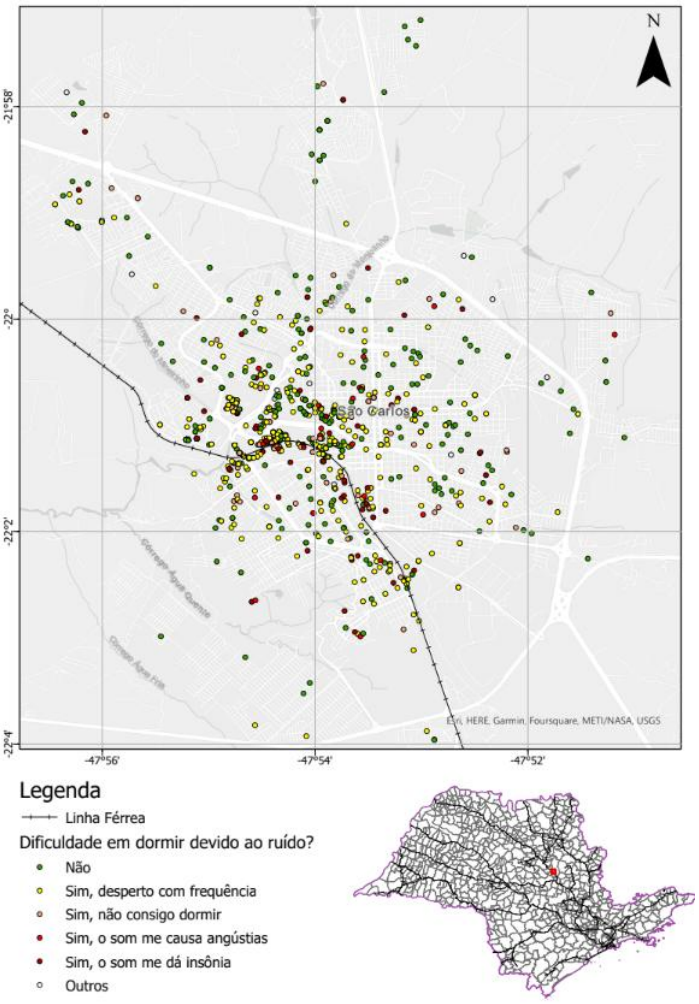
sleep, registering periods of insomnia (Figure 3). The consequences are registered throughout the following day, in which 87.7% of the interviewees feel their work routine affected by symptoms such as: headache (7%); anxiety (5%); and, stress (35%).

Figure 3: Consequences of awakening from sleep by blowing the horn.



Source: own authorship

With the activation of the horn, therefore, all measurements indicate that the noise emission exceeded the standards of the legislation and technical standards (CETESB, 2010; ABNT, 2017; ABNT, 2019). And once having exceeded these standards, said noises also affect the well-being, peace and public health of the surrounding population by the consequences on sleep disturbance (Pearsons et al, 1995; Mindell; Owens, 2009; Wehrens; Hampton; Skene, 2011; Dematteis et al, 2012; Cowan, 2016).

Leive and Morisson (2020), after researching scientific studies based on concrete cases, list a series of personal, social and environmental problems due to lack of sleep, such as health problems or premature death (Mindell; Owens, 2009; Wilcock; Hocking, 2015). In the case of inadequate sleep, as presented in the research in the city of São Carlos-SP, it is associated with mood problems, behavioral disorders, general health problems such as

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obesity, substance abuse and poor quality of life in general (Mindell; Owens, 2009); both the quantity and quality of sleep impact on lifestyle, impacting in the daily routine of people, consequently, in the quality of life (ST- ONGE, 2016).

The mitigating measures listed by the urban community are indicative of the level of disturbance to which they are subjected. In this particular, some measures were listed resulting from the proposed actions for minimizing railway noise, so as to raise the possibility for the representatives of the Public Prosecution Office (MP) to demand the company responsible for railway transportation to reduce or eliminate negative impacts of medium and long duration, as well as reversible and irreversible ones. Such measures must be monitored in order to drive the progress of environmental quality, whether for the adoption of other complementary measures, should they become necessary over time and, above all, to restore the quality of life of the urban community as to the reduction of noise pollution arising from the noise produced by the railway system. Table 3 shows a compilation of some of the mitigating measures aligned with the proposals.

Chart 3: Mitigating measures

Environment	1st Order Negative Environmental Impact	Mitigating Measures
Anthropic	Increased physical and biochemical reaction of the individual as a result of nocturnal noise	
	when the train horn is sounded before and during level crossing. (T); (M)	Reducing the number of noise emissions coming from the warning signal during train passage at night. Minimizing or modifying the sound emission from the train warning signal during train passage before and during level crossings. Reducing the overall railroad noise levels during train passage at night, from the maintenance of the rolling equipment and calibration of the sound signal (horn). Projection of acoustic barriers (built or vegetation) in the places destined to trigger the train's sound signal when it passes in residential areas, hospitals, public buildings and school buildings (university, public and private schools and day care centers)
	Increased sleep disturbance, characterized by difficulty, as a result of interrupted nighttime sleep when the train horn is blown before and during level crossing.(L); (R)	
	Increased concern about nighttime sleep as a result of it being interrupted when the train horn is blown before and during level crossings. (L);(R)	
	Decreased quality of life, as a result of the noise at night when the train horn blows before and during the level crossing. (M); (R)	

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Environment	2nd Order Negative Environmental Impact	Mitigating Measures
Anthropic	Increased stress, as a consequence of insomnia, due to the interruption of night sleep when the train horn is blown before and during the level crossing.(M)/(L); (R)	Projection of construction works in the vicinity (areas) of level crossings, in order to restrict pedestrian invasion in the railway modal. Monitoring and supervision of the ROF, regarding procedures for activating the train's sound signal during the passage before and during level crossings. Train conductor training, where possible, to foster and develop additional requirements on signal sounding and traffic safety. Develop alternative train audible signal models as a result of meeting safety requirements for identification of venomous animals.
	Increased irritability, anxiety, and bad feelings as a consequence of stress due to the interruption of night sleep when the train horn is blown before and during the level crossing. (M)/(L); (R)	
	Decreased quality of life, as a result of the noise at night when the train horn blows before and during the level crossing. (M); (R)	

Source: Own authorship

These mitigating measures need to be urgently implemented by the concessionaire company, since the World Health Organization (WHO) recommends that the noise level in residential areas should not exceed the equivalent sound level Leq of 55 dB (A), where values above can provoke mild stress accompanied by discomfort; the level of Leq=70 dB (A) is considered a level of organism wearing, increasing the risks of cerebral hemorrhage, arterial hypertension, infections, and other pathologies; at Leq=80 dB (A) endorphins are released, causing sensation of momentary pleasure; and sound levels of Leq=100 dB (A) can lead to damage and or loss of auditory acuity (WHO, 2003). In order not to produce adverse effects on sleep, the WHO recommends that nighttime noise exposure, as a result of noise produced by nighttime rail traffic, should not exceed 44 dB L.night (WHO, 2018).

The city of São Carlos-SP has a legal norm that regulates the emission of noise and the use of horns by railway compositions traveling within the urban perimeter.

According to this law, the railroad transport activity, which includes the use of horns in the urban perimeter of the municipality, will obey the interests of health and public peace, and cannot exceed the limits established by law, as shown in Table 1.

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Table 1 – Railway noise emission limits in São Carlos-SP, in decibels.

Types of areas	Daytime	Nighttime
Farm and ranch areas	40	35
Strictly urban residential area or for hospitals or schools	50	45
Mixed area, predominantly residential	55	50
Mixed area, with commercial and administrative purposes	60	55
Mixed area, with recreational purposes	65	55
Predominantly industrial area	70	60

Source: São Carlos (2020)

The municipal law establishes a transition period, between the passing of a law until the adaptation of the safety equipment of railway trains to the foreseen sound pressure level. During this time, the use of horns by railway trains traveling through the urban perimeter in the Municipality is prohibited between the hours of 10 pm and 6 am, except in special cases, justified by "situations of concrete risk to the life of people and animals, evidenced by the presence of an obstacle on the railway line," and a report must be prepared by the train driver responsible for the train, justifying the use of the horn (São Carlos, 2020, Article 1). And in case of non-compliance with the terms and conditions set forth in this law, the violator will be subject to a fine and other sanctions to be regulated by the Executive (São Carlos, 2020, Article 2).

Maps 1, 2 and 3 indicate a mostly urban occupation of the territory, being present: strictly urban residential area or hospitals or schools; mixed area, predominantly residential; mixed area, with commercial and administrative purposes; and mixed area, with recreational purposes. Thus, where human occupation occurs, which may be directly affected by railway noise, the night limits range from 35 to 55 decibels, very close to what is established by the WHO.

4 CONCLUSION

Although the railway system, either for cargo or passengers, is considered to have the least impact on ecosystems, because it is less polluting and has lower costs compared to road transport, considering the long distances traveled, this system has its drawbacks when it comes to noise pollution, especially in urban areas, where there is a fixed route.

As observed, the sound signal (horn) at night (11 pm to 6 am) represents part of the global railway noise that causes the most impact on the anthropic environment, since it has repercussions on the quality of life of the population, due to the consequences resulting from sleep disturbance that can cause mental and physical tiredness, triggering other impacts on the physical and mental health of those affected, such as lack of concentration, spoken communication, and learning, for example.

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Besides this, this individual or collective discomfort, caused by shorter periods of sleep can also have repercussions on the cardiovascular system, resulting from the constant state of alertness due to the long exposure to railway noises. In this aspect, it is necessary to consider the global and individual effects on individuals because they may not present themselves immediately, coming to manifest themselves after a long period of time.

Thus, the control of global railway noise represents an effective action for minimizing environmental impacts on human health, which can be through legal or operational regulations that create mechanisms to reduce the speed at which trains pass through urban areas, or that maintain the road network and the trains, adapting them with more efficient and less noisy engines, or even that limit traffic or create routes at times that have less of an impact on the urban community.

In addition, the sound triggers related to system safety in the operation of trainsets at level crossings should be reevaluated for alert characteristic soundings, without a significant increase in the sound pressure level.

The municipal legislation in the case studied establishes a prohibition on blowing the horn at night, until measures are taken to adapt the safety equipment of railway trains to the sound pressure level provided by law, under penalty of fines and other sanctions to be regulated by the local Executive Power. The law establishes limits in order to meet the interests of health and local public harmony.

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DECLARATIONS

AUTHOR CONTRIBUTIONS

- **Study Conception and Design**: Cátia Araujo Farias, Celso Maran de Oliveira, and Vandoir Bourscheidt.
- **Data Curation**: Cátia Araujo Farias, Celso Maran de Oliveira, and Vandoir Bourscheidt.
- **Formal Analysis**: Cátia Araujo Farias, Celso Maran de Oliveira, and Vandoir Bourscheidt.
- **Funding Acquisition**: Celso Maran de Oliveira.
- **Investigation**: Cátia Araujo Farias, Celso Maran de Oliveira, and Vandoir Bourscheidt.
- **Methodology**: Cátia Araujo Farias, Celso Maran de Oliveira, and Vandoir Bourscheidt.
- **Writing** – Original Draft: Cátia Araujo Farias.
- **Writing – Critical Review**: Cátia Araujo Farias, Celso Maran de Oliveira, and Vandoir Bourscheidt.
- **Writing – Final Review and Editing**: Cátia Araujo Farias, Celso Maran de Oliveira, and Vandoir Bourscheidt.
- **Supervision**: Celso Maran de Oliveira.

DECLARATION OF CONFLICTS OF INTEREST

We, Cátia Araujo Farias, Celso Maran de Oliveira, and Vandoir Bourscheidt, declare that the manuscript entitled *"***Environmental impacts caused by railway noise in a countryside brazilian city***"*:

1. Financial Interests: There are no financial relationships that could influence the results or interpretation of the study.
2. Professional Relationships: No professional relationship relevant to the content of this manuscript has been established.
3. Personal Conflicts: No personal conflicts related to the content were identified.