*International Journal Of Engineering Research And Development*
*e- ISSN: 2278-067X, p-ISSN: 2278-800X, www.ijerd.com*
*Volume 20, Issue 11 (November, 2024), PP 72-78*

# The Importance of Safety Assessment for Workers in Wind Farms in Brazil

Josy Fonteles Ribeiro da Silva[1] https://orcid.org/0009-0001-2569-2619; José Nabuco Ribamar Neto[2] https://orcid.org/0009-0001-4648-531X; Luiz Sérgio Nocrato Vidal[3] https://orcid.org/0000-0002-9790-3454; Rickardo Léo Ramos Gomes[4] https://orcid.org/0000-0001-6101-9571

*[1] Postgraduate in MBA in Renewable Energy Management (IEL/FBUNI);[2] Postgraduate in MBA in Renewable Energy Management (IEL/FBUNI); [3] Postgraduate in MBA in Renewable Energy Management (IEL/FBUNI); [4]Doctorate in Biological Sciences - FICL; Master's in Phytotechnics - Federal University of Ceará; Corresponding Author: Rickardo Léo Ramos Gomes*

***ABSTRACT***
*The growth of wind energy in Brazil has driven the development of wind farms in various regions, especially in the Northeast, bringing economic and environmental benefits. However, the sector also presents significant occupational risks, mainly related to activities at height and the handling of heavy loads. In light of this, this article sought to assess the importance of worker safety in wind farms in Brazil, based on an integrative literature review. The methodology consisted of analyzing articles and studies published between 2017 and 2024, consulted from the Scielo, PubMed, and Google Scholar databases. The main objective was to analyze the safety practices implemented in Brazilian wind farms, identifying the main occupational risks faced by workers and proposing improvements to reduce these risks and enhance safety in the sector. The study concluded that, although the wind energy sector has advanced in Brazil, there are still gaps in the implementation of safety measures, particularly concerning the continuous training of workers and the adoption of international certifications. It is recommended to systematically collect data on accidents and to intensify training and inspections to ensure a safer and more efficient working environment, ensuring the sustainable expansion of the wind energy sector in the country.*

***Keywords****: Wind farms; Occupational safety; Accidents; International Certifications.*

---

Date of Submission: 02-11-2024 Date of Acceptance: 12-11-2024

---

## I. INTRODUCTION

Brazil stands out globally for its predominantly renewable-based electricity generation matrix, particularly relying on hydropower and sugarcane biomass. In addition to these, sources like wind energy have also become part of this matrix in recent years, reinforcing the role of clean energy in the country (Bezerra; Santos, 2017). Wind energy has emerged as one of the primary alternative energy sources worldwide, due to its sustainable generation capacity and lower environmental impact compared to conventional energy sources. In Brazil, the development of wind farms has gained momentum over the past decades, especially in regions with high wind potential, such as the Northeast. The inclusion of this energy matrix in the national scenario represents a response to demands for renewable sources and the reduction of greenhouse gas emissions (Cunha; Silva; Silva, 2024).

However, alongside the benefits of this expansion, concerns arise regarding the safety of workers operating in wind farms, given the nature of activities involved, from testing and component production to transportation, installation, and maintenance (Paiva; Oliveira; Silva, 2022). According to the Statistical Yearbook of Work Accidents (AEAT), Brazil ranked fourth globally in work accidents in 2021, with a total of 536,174 accidents. This statistic underscores the relevance of analyzing the safety conditions of workers in the wind energy sector, a relatively recent segment in Brazil that faces a shortage of specialized labor. Moreover, proper training and education of workers, combined with improvements in the reliability of systems and technologies, are critical elements to ensure workplace safety and minimize the occurrence of failures and accidents (Brazil, 2021).

The analysis of safety conditions in wind farms remains underexplored and scarcely published, with most information stemming from European initiatives. For instance, the United Kingdom, through the Renewable Industry Safety Exchange (RISE), shares information on accidents and safety in the sector. These initiatives aim to promote the exchange of experiences and data to improve safety practices within the wind energy sector (Steel, 2016). In this context, the present study aims to analyze the safety practices implemented in wind farms in Brazil,

identifying the main occupational risks faced by workers and proposing improvements to reduce these risks and enhance safety in the sector. To achieve this purpose, the specific objectives are: (i) to identify the main risk factors involved in the activities of workers in wind farms in Brazil; (ii) to assess the application and effectiveness of current occupational safety standards and regulations in the Brazilian wind sector; and (iii) to propose improvement strategies based on studies and recommended practices, aiming to reduce accidents and promote a safer work environment.

This article is structured into five sections, in addition to the introduction. The second section presents the theoretical foundation, where the main concepts and studies related to the topic are discussed. The third section describes the methodology used to conduct the integrative review. The fourth section addresses the analysis of the results obtained, accompanied by an in-depth discussion of the findings. Finally, the last section provides the final considerations, highlighting conclusions and suggestions for future research and improvements in wind farm safety.

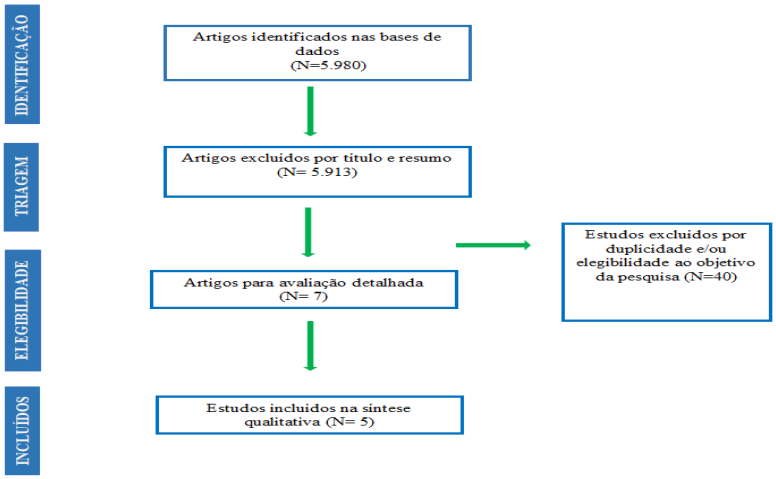
## II. MATERIAL AND METHODS

The present study employed an integrative literature review as its method. According to Souza, Silva, and Carvalho (2010), the integrative literature review is the broadest methodological approach for reviews, allowing the inclusion of experimental and non-experimental studies to gain a comprehensive understanding of the phenomenon analyzed. The development of this integrative review followed four phases described below: identifying the topic and selecting the research question; establishing inclusion and exclusion criteria for studies; identifying predetermined and selected studies; and synthesizing the selected articles.

In the first phase, the following guiding question was formulated: What are the main practices, regulations, and challenges related to worker safety in wind farms in Brazil? During the second phase, sampling or literature search was conducted, applying inclusion and exclusion criteria. The inclusion criteria used for sample selection included articles in Portuguese and English, monographs, theses, and dissertations, published between 2017 and 2024, addressing the guiding question, and found in the following databases: Scientific Electronic Library Online (SCIELO), PUBMED, and Google Scholar. The exclusion criteria eliminated studies that did not address the guiding question or were unavailable in full. The following keywords were used: Wind Farms; Occupational Safety; Accidents.

Subsequently, all abstracts and titles were read as a preliminary screening, followed by a full evaluation of the studies to determine their eligibility. This full evaluation allowed us to determine the number of studies included in the analysis. If the abstract was insufficient to confirm the study's inclusion according to the predefined criteria, the study was read in full to assess its eligibility. In the third phase, aiming for a more in-depth analysis and discussion, the content extracted from the studies was subdivided into thematic categories. Relevant data from the previously selected articles were systematically selected using an instrument developed by the researchers. This instrument facilitated data synthesis and comparison, allowing for a more objective interpretation. A total of 5,980 studies were found in the previously mentioned databases. Of this total, 5,913 were excluded based on title and abstract, and 40 were excluded due to duplication and/or lack of alignment with the research objective, leaving 7 studies for full analysis. Of these, 5 were included in the qualitative synthesis. To better illustrate the data analysis steps, a Flowchart model was chosen, aiding in the statistical distribution of the findings, as shown in Figure 1.

Figure 1 – Flowchart demonstrating the selection of studies according to the databases.




Source: Researchers' Data

After selection, a table was created to analyze and interpret the study data, presenting the author, year, title of the work, general objective, and results, respectively.

## III. THEORETICAL FRAMEWORK

This theoretical foundation was organized into three main subtopics, each addressing a critical aspect of worker safety in wind farms in Brazil: (1) Risks Involved in Working in Wind Farms. In this first subtopic, an analysis was conducted on the primary risks faced by wind farm workers. (2) Survey of Accidents in the Wind Sector: In this second subtopic, the most common types of accidents and their underlying causes are discussed, with attention given to the underreporting of accidents in the sector. (3) Training and Qualification of Workers in the Wind Sector: The third subtopic emphasizes the importance of continuous training for workers. Examples of international best practices are presented, which could be implemented in Brazil to reduce accidents and improve operational efficiency.

### 3.1 Risks Involved in Working in Wind Farms

Wind farm workers face numerous risks, primarily involving falls from significant heights and handling heavy loads. These risks are heightened in confined spaces with limited ventilation, especially during construction, where cranes lift components up to 130 meters. Additional risks include ergonomic strain, fatigue, adverse weather conditions, noise, and vibration. During maintenance, which typically involves fewer personnel, workers encounter risks such as contact with moving parts, high-voltage cables, and hazardous access points via long ladders or lifts (Azevedo, 2017).

Studies indicate that falls from great heights are one of the leading causes of fatal accidents in the wind energy sector. Turbines, which can exceed 100 meters, require the proper use of fall protection systems, such as safety harnesses and lifelines, as stipulated by NR-35. Falls often result from inadequate risk assessments, improper use of Collective Protection Equipment (CPE) and Personal Protective Equipment (PPE), insufficient training on fall-free zones and rescue procedures, and over-reliance on PPE as the primary solution (Feiten, 2015).

Another significant hazard is electrical risk, as operations involve high-voltage systems. NR-10, which regulates electrical safety, establishes guidelines to prevent electrical accidents, such as requiring specific training and PPE usage. Additionally, poor maintenance of components can lead to short circuits and electric shocks, posing a danger to both workers and facilities (Brasil, 2020).

Adverse weather conditions also amplify risks in the wind sector. In parks located in coastal areas or regions with strong winds, maintenance and assembly operations can be impacted by sudden weather changes, increasing the likelihood of accidents. Handling heavy components, such as turbine blades and generators, also presents considerable risk. The movement of heavy loads requires proper techniques and specialized equipment to prevent musculoskeletal injuries, which are common in the transportation and assembly of large components (Paiva, Oliveira, Silva, 2022).

Moreover, prolonged exposure to noise and vibration can lead to adverse health effects, including hearing loss and physical harm. According to Pardal (2013), the noise from wind turbines can be particularly harmful to workers performing maintenance near generators, resulting in symptoms such as sleep disturbances and balance issues. Therefore, worker safety in wind farms depends on strict adherence to safety standards and comprehensive training designed to minimize risks and promote a safe, healthy work environment.

### 3.2 Survey of Accidents in the Wind Energy Sector

A work-related accident is defined as any event that occurs during labor activities, resulting in bodily injury, functional impairment, or even death, which leads to a temporary or permanent loss or reduction in work capacity. These accidents may be caused by internal factors, such as operational failures, or external factors, such as unsafe working conditions (Suave, Fonseca, Herek, 2020).

According to Article 19 of Law No. 8,213 of July 24, 1991:

> A work-related accident is one that occurs in the exercise of work on behalf of a company or domestic employer or in the exercise of work of insured persons mentioned in item VII of Article 11 of this Law, causing bodily injury or functional impairment resulting in death or loss or reduction, whether permanent or temporary, of work capacity (Brasil, 1991).

The rapid growth of wind energy in Brazil has led to a significant increase in workers involved in various stages of construction, operation, and maintenance of wind farms. However, these processes also expose workers to considerable risks, as demonstrated by recent fatal accidents in the sector (Silva, 2021).

Although wind energy is a growing industry in Brazil, official data on fatal accidents remains limited, often being reported solely by media outlets. Many accidents in the wind sector are not formally reported, making it challenging to gather accurate data and conduct statistical analysis. This lack of detailed information on the frequency and severity of accidents complicates the implementation of effective preventive measures, thereby increasing risks for workers.

According to the Caithness Windfarm Information Forum (CWIF), 1,556 accidents have occurred in wind farms worldwide over the past 10 years. The most common accident was turbine blade failure, accounting for 15.17% of incidents, or 236 occurrences. Fire was the second most common, with 12.92%, representing 201 incidents. Notably, 86 accidents resulted in fatalities, comprising 5.53% of the total. The "other" category included incidents involving dust, explosion, electric shock, short circuits, and water intrusion, each occurring only once over the past decade (SSA Volunteer, 2018).

In Brazil, Silva (2021) reports various fatal accidents between 2017 and 2020, including falls from significant heights during turbine maintenance and incidents where heavy parts fell on workers. On July 26, 2019, two workers lost their lives while conducting maintenance on a 40-meter tower at a wind farm in Caetité, Bahia. The accident occurred when the tower twisted, causing the workers to fall (Jornal Globo, 2019).

This was one of the first fatal accidents reported in this sector in Brazil. On January 27, 2020, a contracted worker died in an accident at the Lagoa do Barro wind farm in Piauí. A piece weighing approximately 100 kg fell on his head, resulting in instantaneous death (Jornal Cidade Verde, 2020).

This incident highlighted the dangers associated with handling large equipment during wind farm operations. Another fatal accident occurred on June 22, 2020, at a wind farm in Serra do Mel, Rio Grande do Norte. A worker fell from a height of 35 meters while performing maintenance on a tower. The severity of the accident was compounded by difficulties faced by the military police in accessing the site, a recurring issue in other fatal incidents in the sector (Jornal Globo, 2020).

On August 30, 2020, two individuals died in a traffic accident in Ceará when a wind turbine blade detached from a truck during transport and crushed the car they were in. The accident occurred on the road leading to the Parambu wind farm, underscoring the risks not only in field activities but also in transporting components (Jornal Ceará Notícias, 2020).

These incidents underscore the urgent need to reinforce safety measures in Brazilian wind farms, covering activities from maintenance to the transportation of large components. The lack of systematic accident data in the sector makes it even more challenging to develop effective strategies for prevention and response to these tragic events.

### 3.3 Training and Qualification of Workers in the Wind Energy Sector

Proper training for workers in wind farms is one of the main pillars to ensure safety within the sector. Considering that operations involve working at great heights, handling complex equipment, and exposure to extreme weather conditions, continuous and specialized training is indispensable. To prevent accidents, it is essential that worker training be ongoing, with annual refreshers. A common practice in wind farms is outsourcing the training team, selecting instructors based on their expertise and mastery of techniques and equipment, ensuring high-quality training. This effort to keep workers updated goes beyond theoretical knowledge, incorporating practical activities that simulate real situations faced in the sector, fostering greater awareness of risks and appropriate safety measures (Azevedo, 2017).

Azevedo (2017) also highlights the importance of rigorous audits and inspections to ensure that safety procedures are strictly followed, preventing workers from neglecting proper procedures due to routine familiarity with the environment. A combination of thorough training, continuous monitoring, and the use of adequate protective equipment are crucial to minimizing risks in the wind sector, ensuring that professionals are prepared to handle adverse conditions and emergency situations demanded by the work.

A study conducted in a hypothetical wind engineering company shows that, even without mandatory certifications, the adoption of stricter standards and the implementation of a more robust management system can help prevent accidents over an extended period. This finding underscores the importance of intensifying strict management of contracted companies and continuous oversight of operational activities, emphasizing the critical role of training for all those involved in wind farm operations (Carvalho et al., 2019).

## IV ANALYSIS OF RESULTS

In total, five studies were analyzed and incorporated into this research. These studies were available in full text, free of charge, with a focus on those published within the past seven years (2017-2024) that met the inclusion criteria outlined in Table 1.

**Table 1:** Selected Studies for Analysis

| Author(s) Year | Title | General Objective | Results |
|---|---|---|---|
| Azevedo (2017) | Safety in Work at Heights in Compliance with NR-35 – In the Construction and Maintenance of | Analyze the risks of working at heights in the construction and maintenance of wind turbines in João | The study showed that the lack of adequate training and non-compliance with NR-35 regulations increase the risks |

| Author(s) Year | Title | General Objective | Results |
|---|---|---|---|
| | Wind Turbines in the João Câmara/RN Region. | Câmara/RN and propose solutions to ensure compliance with NR-35. | of accidents at height. Solutions were proposed to improve safety. |
| Winter; Segalovich (2018) | Analysis of Safety Conditions in Wind Farms. | Analyze the safety conditions in wind farms in Brazil and propose an improvement plan. | A gap was identified in the data collection regarding accidents, as well as failures in fire prevention. An improvement plan was proposed. |
| Carvalho *et al.* (2019) | Implementation of Safety and Health Standards in a Wind Energy Company. | Discuss the implementation of safety and health standards in a wind energy company and evaluate the need for international certifications. International certification can enhance safety but faces barriers such as high costs. | The implementation of safety standards is essential. |
| Meyer *et al.* (2021) | Wind Energy: Aspects of Occupational Safety. | Examine the aspects of occupational safety in the manufacturing, transportation, assembly, and maintenance of turbines. | Significant risks were identified, such as falls from heights and failures in the use of personal protective equipment (PPE). Safety in the sector remains insufficient. |
| Paiva; Oliveira; Silva (2022) | Safety in Heavy Load Handling in Wind Farms. | Analyze the safety of heavy load handling in wind farms, focusing on the use of cranes and risk control. | The study highlighted the importance of rigging plans and stringent controls to prevent accidents during heavy load handling. Improper use of cranes can lead to tip-overs and fatalities. |

Source: Researchers' Data

Safety in the Wind Energy Sector in Brazil faces significant challenges as the industry expands. The study by Winter and Segalovich (2018) indicates that the lack of a national database on accidents complicates the monitoring and implementation of effective safety improvements. Additionally, fires in wind turbines, one of the major identified risks, result from failures in both the operation and maintenance of the turbines, highlighting the need for a national policy focused on prevention and workplace safety. Workers in the sector face inherent risks associated with working at heights, particularly in hard-to-reach environments, as emphasized by Meyer et al. (2021).

The study stresses that while the application of NR-35 and other regulations such as NR-12 and NR-10 is crucial, inadequate training for workers to handle adverse situations—such as strong winds and improper use of personal protective equipment (PPE)—remains a frequent issue. Azevedo (2017) further underscores this concern by analyzing working conditions in wind farms in the João Câmara/RN region, noting that many accidents may be related to the lack of adequate training and non-compliance with NR-35, which aims to ensure safety in work at heights.

Moreover, Azevedo's study suggests that prolonged exposure to extreme working conditions, such as high winds and confinement, increases risks for workers, emphasizing the importance of rigorous supervision and strict adherence to regulations.

Another point raised by Carvalho et al. (2019) is the necessity for international certifications, such as ISO 45001 and OHSAS 18001, which, despite representing a high cost for companies, are fundamental in establishing a safety culture that can drastically reduce accidents. The case reported in the study demonstrates that even with a positive safety history, a lack of rigidity in controls can lead to serious accidents, such as a worker's fall, indicating the need for greater oversight and internal control within sector companies.

Additionally, the study by Paiva, Oliveira, and Silva (2022) highlights the importance of safety in heavy load handling, particularly with the use of cranes, an essential activity during the construction and maintenance of wind farms. The study notes that without a well-developed rigging plan, there is a high risk of crane tip-overs, load drops, and fatalities. Implementing strict controls, adequately training workers, and applying collective and individual protective equipment are essential measures to mitigate these risks. Improper use of cranes or the absence of prior risk analysis can lead to serious accidents, as pointed out by Paiva, highlighting that safety practices in load handling are crucial for protecting workers' physical integrity.

In addition to physical and operational risks, Meyer et al. (2021) also address the importance of a safe working environment to preserve workers' long-term health. Inadequate conditions, such as repetitive work, confined spaces, and exposure to noise and vibrations, can lead to chronic health issues that are often not properly monitored in the wind sector. Implementing occupational health programs to monitor these risks is essential for improving working conditions. Therefore, safety in the wind sector in Brazil requires a more comprehensive

approach, encompassing both regulation and continuous monitoring, as well as the implementation of certifications and training.

The absence of a robust database, as noted by Winter and Segalovich (2018), limits the ability of companies and regulatory bodies to fully understand risks and develop preventive solutions. Thus, a coordinated effort among government, companies, and workers is necessary to ensure that the sector grows in a safe and sustainable manner.

## IV. DISCUSSION AND CONCLUSION

The safety of workers in wind farms in Brazil is a critical aspect that requires continuous attention and ongoing improvements. Based on this integrative review, it can be concluded that although the Brazilian wind sector has made significant progress, there remains a gap in the effective implementation and enforcement of safety regulations.

Falls from heights, failures in the use of personal protective equipment (PPE), and insufficient training have been identified as the primary risk factors faced by workers. Furthermore, the lack of systematically organized data on accidents hinders the development of more effective preventive policies. To mitigate these risks, it is suggested that future research further explores the impacts of the work environment in wind farms, focusing on improving safety practices at heights and planning for emergency rescues.

A joint effort between the government and companies is also necessary to implement international certifications, such as ISO 45001, which can enhance the level of safety and accident prevention in the sector. Another important point is the promotion of more frequent and specific training for workers, ensuring that all are adequately prepared to handle the inherent risks associated with activities in wind farms.

Finally, it is recommended that new studies investigate the feasibility of a national system for collecting and monitoring data on accidents in the wind sector, which could provide a solid foundation for creating more targeted and effective preventive measures, thereby contributing to the safety and well-being of workers in the renewable energy sector in Brazil.

## REFERENCES


[1] Azevedo, P. H. M. (2017). Safety in working at heights in accordance with NR-35: In the construction and maintenance of wind towers in the region of João Câmara/RN (Undergraduate thesis, Federal University of Rio Grande do Norte). Natal, Brazil.

[2] Bezerra, F. D., & Santos, L. S. (2017). Potentials of wind energy in the Northeast. Technical Office for Economic Studies of the Northeast – ETENE, 2(5), 1-19.

[3] Brasil. (1991). Law No. 8.213, of July 24, 1991: On the purposes and basic principles of social security. Brasília, DF.

[4] Brasil. Ministry of Social Security. (2021). Statistical yearbook of work accidents (AEAT). Brasília, DF. Available at: https://www.gov.br/previdencia/pt-br/assuntos/previdencia-social/saude-e-seguranca-do-trabalhador/acidente_trabalho_incapacidade/arquivos/copy_of_AEAT_2021/aeat-2021 [Accessed 24 Oct. 2024].

[5] Brasil. Ministry of Labor and Employment. (2020). Regulatory standard NR-10. Available at: https://www.gov.br/trabalho-e-emprego/pt-br/acesso-a-informacao/participacao-social/conselhos-e-orgaos-colegiados/comissao-tripartite-partitaria-permanente/normas-regulamentadora/norma-regulamentadora-no-10-nr-10 [Accessed 23 Oct. 2024].

[6] SSA Volunteer. (2018). Caithness Windfarm Information Forum (CWIF) - Accident statistics: Summary of wind turbine accidents. Available at: https://scotlandagainstspin.org/2021/07/caithness-windfarm-information-forum-cwif-accident-statistics [Accessed 23 Oct. 2024].

[7] Carvalho, J. A., et al. (2019). Implementation of safety and health standards in a wind energy company. Revista Alcance, 26(3), 247-260. https://doi.org/10.1590/1983-716X [ISSN: 1983-716X].

[8] Cunha, G. S., Silva, J. A., & Silva, W. G. (2024). Sustainable development and wind energy in Brazil. Mackenzie Economic Journal, 21(1), 183-210. https://doi.org/10.1590/1808-2785 [ISSN: 1808-2785].

[9] Feiten, J. (2020). Training for working at heights. Novo Hamburgo: Proteção. Available at: http://www.protecao.com.br/materias/leia_na_Íntegra/capacitacao_para_trabalho_em_altura [Accessed 28 Oct. 2024].

[10] Jornal Ceará Notícias. (2020). Wind turbine on truck crushes car, killing two in Ceará. Available at: https://g1.globo.com/ce/ceara/noticia/2020/08/30/helice-eolica-transportada-por-carreta-esmaga-carro-e-deixa-dois-morto-na-br-020-no-interior-do-ceara.ghtml [Accessed 23 Oct. 2024].

[11] Jornal Cidade Verde. (2020). Worker dies in wind farm after piece falls on his head. Available at: https://cidadeverde.com/noticias/316741/operario-morre-em-complexo-eolico-apos-peca-cair-sobre-sua-cabeca [Accessed 20 Oct. 2024].

[12] Jornal Globo. (2019). Two men die after wind energy tower they were in collapses in Bahia. Available at: https://g1.globo.com/ba/bahia/noticia/2019/07/26/dois-homens-morrem-apos-torre-de-energia-eolica-em-que-estavam-cair-na-bahia.ghtml [Accessed 20 Oct. 2024].

[13] Jornal Globo. (2020). Worker falls from wind tower while working and dies in RN. Available at: https://g1.globo.com/rn/rio-grande-do-norte/noticia/2020/06/20/jovem-de-21-anos-cai-de-torre-eolica-em-que-trabalhava-e-morre-no-rn.ghtml [Accessed 20 Oct. 2024].

[14] Meyer, F. N., et al. (2021). Wind energy: Aspects of workplace safety. IV Workshop on Petroleum Engineering, 1, 1-5.

[15] Paiva, Z. P., Oliveira, F. N., & Silva, S. S. (2022). Safety in heavy load handling in wind energy parks: A literature review. Undergraduate thesis, Federal Rural University of the Semi-Arid (UFERSA). Mossoró, Brazil.

[16] Pardal, T. (2013). Occupational noise: Low frequency: vibroacoustic disease vs. wind turbine syndrome (Master's thesis). Superior School of Business Sciences, Setúbal, Portugal.

[17] Silva, L. G. G. (2021). Fatal work accidents in two phases of wind energy in Brazil. National Production Engineering Meeting – Enegep, 1(1), 1-15.
[18] Souza, M. T., Silva, M. D., & Carvalho, R. (2010). Integrative review: What is it and how to do it. Einstein (São Paulo), 8, 102-106. https://doi.org/10.1590/S1679-45082010RW2207 [ISSN: 2317-6385].
[19] Steel, W. (2016). Minimizing worker safety risks in the wind energy industry. Renewable Energy World, 7(26), 18-25.
[20] Suave, F. H. M., Fonseca, M. C. A., & Herek, S. (2020). Provisional stability resulting from work accident in temporary contracts. Iuris Novarum, 2(1), 1-11. https://doi.org/10.1590/2764-247X [ISSN: 2764-247X].
[21] Winter, A. C., & Segalovich, R. N. (2018). *Analysis of safety conditions in wind farms* (Undergraduate thesis, Federal Technological University of Paraná). Curitiba, Brazil.