

AN UNJUST ENERGY TRANSITION MODEL

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Antonio Fernando Megale Lopes*

Felipe Gomes da Silva Vasconcelos**

Fernanda Caldas Giorgi***



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* Partner at LBS Advogadas e Advogados and member of the Instituto Lavoro. Specialist in Public Management and in Human Rights at Work and Transnational Labor Law from the Universidad de Castilla-La Mancha. *Ad hoc* consultant to the Labor, Education, and Social Security Commission of the *National Human Rights Council (Brazil).

** Partner at LBS Advogadas e Advogados and member of the Instituto Lavoro. Holds a master's degree (MSc) in Labor Law and Social Security Law from the University of São Paulo (USP) and an advanced LLM (cum laude) in International and European Human Rights Law from Leiden University; Specialist in Labor Human Rights, Transnational Enterprises and Due Diligence from the Universidad de Castilla-La Mancha. Postgraduate Professor at the Presbyterian University Mackenzie and Visiting Professor in the international program at the *University of San Carlos of Guatemala (USAC).

*** Partner at LBS Advogadas e Advogados and Director of the Instituto Lavoro. Specialist in Human Rights at Work and Transnational Labor Law from the Universidad de Castilla-La Mancha.

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Introduction¹

This study presents the case of Serra do Mel, an unjust energy transition model driven by the French multinational Voltalia S/A, which has negatively impacted the human rights of the local community, generating severe socio-environmental and contractual damages. Currently, thirty-six wind power plants are operating in Serra do Mel, totaling 360 wind turbines.

The report will outline the context of wind energy generation in Brazil, and within the State of Rio Grande do Norte and the municipality of Serra do Mel, as well as the adverse impacts that the installation of wind farms can cause to human rights in a setting where regulation is deficient and social participation and oversight are absent. An energy transition cannot take place at the expense of the human rights of the most vulnerable people.

While the adverse impacts are borne by the local population, Voltalia S/A takes advantage of renewable energy generation to capture tax benefits, carbon credits, and renewable energy certificates, thereby fueling an allegedly “green” market disconnected from responsible business conduct.

This study aims to draw attention to the case of Serra do Mel, while also raising awareness of unjust energy transition models that fail to consider the environmental, social, and economic impacts of renewable energy deployment.

Enjoy your reading.

¹ This article was prepared with contributions from the Central Única dos Trabalhadores – CUT (Single Workers’ Central), CUT Rio Grande do Norte, the Federação dos Trabalhadores Rurais Agricultores e Agricultoras Familiares do Estado do Rio Grande do Norte – FETARN (Federation of Rural Workers and Family Farmers of the State of Rio Grande do Norte), the Serviço de Assistência Rural e Urbano – SAR (Rural and Urban Assistance Service), the Instituto de Estudos Socioeconômicos – INESC (Institute for Socioeconomic Studies), the Departamento Intersindical de Estatística e Estudos Socioeconômicos – Dieese (Inter-Union Department of Statistics and Socioeconomic Studies), and the Instituto Brasileiro de Direitos Humanos e Empresas – Homa (Brazilian Institute for Human Rights and Business). The intern Andre João Tomé Antunes also contributed to this paper.

1. Wind Energy Generation in Brazil

In 2024, Brazil reached fifth place in the global ranking of onshore wind power total installed capacity, with 33.7 GW.² This phenomenon was driven by a combination of historical and political factors. The initial momentum arose from the energy rationing crisis in the early 2000s³ and the blackout of 2001, combined with growing concerns about energy security and environmental issues.

Subsequently, the global economic crisis of 2008⁴ led transnational corporations to redirect investments toward emerging markets, such as Brazil, thereby accelerating the deployment of wind farms.

The sector was strongly supported by public policies, such as the Incentive Program for Alternative Sources of Electric Energy (PROINFA in Portuguese) of 2002, as well as tax incentives like the Special Regime for Incentives for Infrastructure Development (REIDI in Portuguese)⁵, state-facilitated credit lines from the National Bank for Economic and Social Development (BNDES in Portuguese), and the promotion of energy auctions.⁶

² BRAZILIAN ASSOCIATION OF WIND ENERGY AND NEW TECHNOLOGIES (ABEEólica). Brazil rises one position and ranks 5th in the Global Wind Energy Ranking. ABEEólica Agency, 2025. Available at: <https://abeeolica.org.br/brasil-sobe-uma-posicao-e-fica-em-5o-lugar-no-ranking-mundial-de-energia-eolica/>. Accessed on 24 Oct. 2025.

³ BRAZILIAN ASSOCIATION OF WIND ENERGY AND NEW TECHNOLOGIES (ABEEólica). The Sector. [s.l.]: ABEEólica, 2025. Available at: <https://abeeolica.org.br/energia-eolica/o-setor/>. Accessed on 24 Oct. 2025.

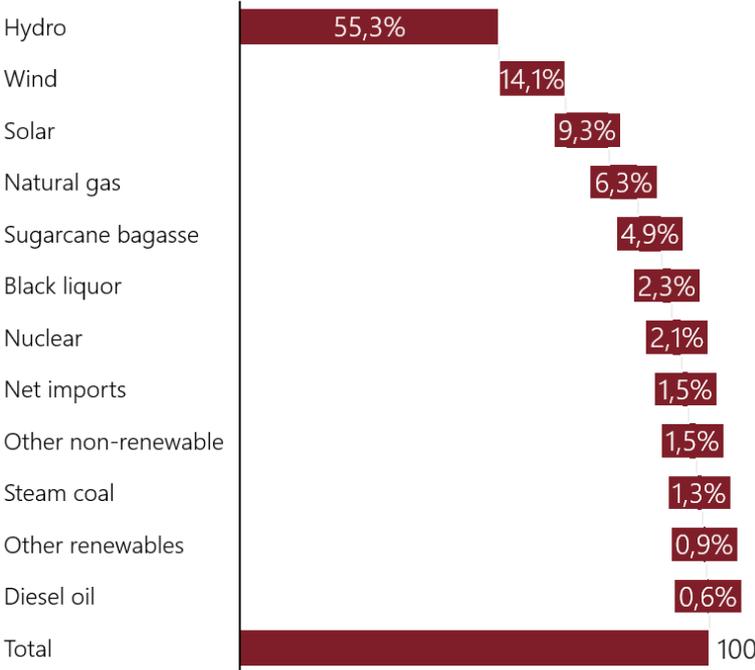
⁴ BAHIA (State). Secretariat of Economic Development (SDE). How the Northeast Became the Main Hub of Wind Energy in Brazil. Salvador, 2015. Available at: <https://www.ba.gov.br/sde/2015/11/17/como-o-nordeste-virou-principal-polo-da-energia-eolica-no-brasil>. Accessed on 24 Oct.

⁵ IMA, Alex Felipe Rodrigues; SACHSIDA, Adolfo; LIMA, George Barbosa de. An Econometric Analysis of the Special Regime for Incentives for Infrastructure Development (REIDI). In: SACHSIDA, Adolfo (Ed.). Public Policies: Assessing More than Half a Trillion Reais in Public Spending. Brasília: Ipea, 2018, p. 299–316. Available at: https://portalantigo.ipea.gov.br/agencia/images/stories/PDFs/livros/livros/181009_politicas_publicas_no_brasil_cap09.pdf. Accessed on 24 Oct. 2025.

⁶ SANTOS; CAMPOS; SOUZA. Public Policies and the Expansion of Wind Energy in Brazil, apud SILVA, Neilton Fidelis da. Renewable Energies in the Expansion of the Brazilian Electric Sector. Rio de Janeiro: Synergia, 2015. Available at: https://engenhariaedesenvolvimentosustentavel.ufes.br/sites/engenhariaedesenvolvimentosustentavel.ufes.br/files/field/anexo/artigo_politicas_publicas_cbpe_2016.pdf. Accessed on 24 Oct. 2025.

Currently, the Brazilian electricity matrix — referring exclusively to the sources used for electricity generation — is mostly renewable (88%).⁷ Wind power ranks second in the country’s internal energy supply, accounting for 14.1%, behind only hydropower, which represents 55.3%.⁸

Domestic supply of electricity by source



Source: Brazil Energy balance, 2024

Graphic 1 – Domestic supply of electricity by source

The expansion of wind generation capacity has been highly concentrated in the Northeastern subsystem, which accounts for 90% of installations, owing to the region’s favorable conditions of strong and constant winds for most of the year.⁹

⁷ ENERGY RESEARCH COMPANY (EPE). National Energy Balance 2025: Base Year 2024. Rio de Janeiro: EPE, 2025, p. 12.

⁸ The scenario changes if we consider Brazil’s overall energy matrix, which encompasses all energy sources for national demand and not only electricity generation. In that case, wind power accounts for only 5.1% of supply (2024), while oil and its derivatives account for 34%. Nevertheless, it is worth noting that Brazil’s energy matrix consists of 47.4% renewable sources, compared to only 14.3% worldwide. EPE. Energy and Electricity Matrix. Available at: <https://www.epe.gov.br/pt/abcdenergia/matriz-energetica-e-eletrica>.

⁹ EPE. Climate Resilience Roadmap. Wind Power Generation and Climate Change: Reflections on Adaptation and the Strengthening of the Resilience of Brazil’s Electric Sector. September 2025. Available at: <https://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-852/topico-736/Geraçã0%20Eólica%20e%20Mudan%C3%A7as%20Clim%C3%A1ticas.pdf>.

2. The Wind Energy Generation Potential of the State of Rio Grande do Norte (RN)

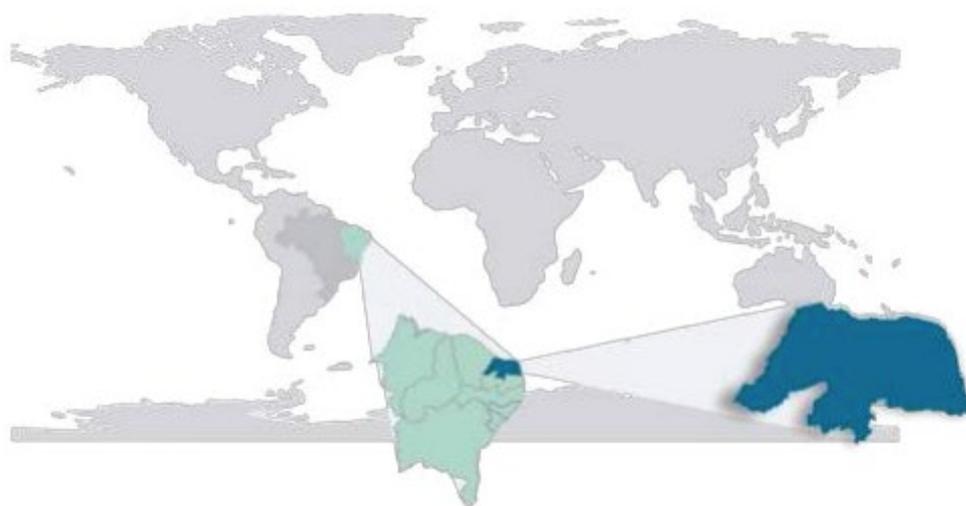


Figure 1 – Geographical location of the State of Rio Grande do Norte¹⁰

In 2024, the State of Rio Grande do Norte ranked as the second-largest producer of wind energy in Brazil,¹¹ with a total production of 29.47 TWh. According to data from the National Electric Energy Agency (ANEEL in Portuguese), the State has 314 wind farms in operation, with an authorized capacity of 10.4 GW. In addition, another 58 projects are either under construction or awaiting construction, representing an authorized capacity of 2.1 GW.¹²

This potential growth indicates that the State still holds significant room for expansion, even after the significant scale of installations already observed.

¹⁰ Image extracted from the Wind and Solar Atlas of the State of Rio Grande do Norte, 2022. Available at: <http://www.adcon.rn.gov.br/ACERVO/sedec/DOC/DOC000000000298278.PDF>.

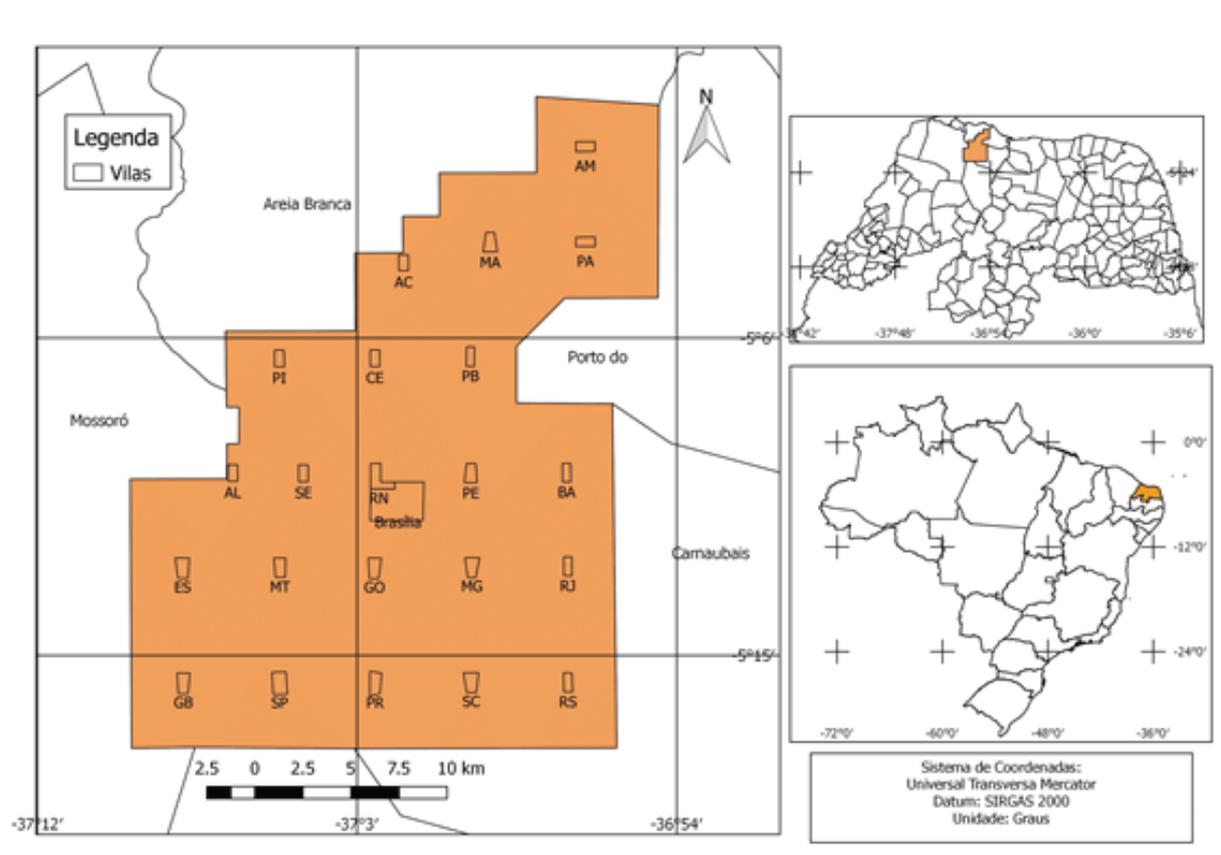
¹¹ BRAZILIAN ASSOCIATION OF WIND ENERGY AND NEW TECHNOLOGIES (ABEEólica). Annual Bulletin 2024. [s.l.]: ABEEólica, 2024. 19 p. Available at: https://abeeolica.org.br/wp-content/uploads/2025/05/424_ABEEOLICA_BOLETIM-ANUAL-2025_PT_Final-Aprovado.pdf. Accessed on 24 Oct. 2025.

¹² Power Generation Information System (SIGA) – ANEEL. Available at: <https://app.powerbi.com/view?r=eyJrjoiNGE3NjVmYjAtNDZkZCooMDY4LTIiNTItMTVvZTU4NWYzYzFmliwidCI6ljQwZDZmOWI4LWVjYTctNDZhMio5MmQoLWVhNGU5YzAxNzBIMSisImMiOjR9>. Accessed on 24 Oct. 2025.

3. The Municipality of Serra do Mel

The municipality of Serra do Mel is in the State of Rio Grande do Norte, Brazil, with a total area of 620.241 km². According to the 2022 Census, its population is 13,091 inhabitants, resulting in a population density of approximately 21.11 inhabitants per km².

The city is composed of 23 villages, each named after a Brazilian state: Vila Rio Grande do Sul, Vila Santa Catarina, Vila Paraná, Vila São Paulo, Vila Guanabara, Vila Rio de Janeiro, Vila Minas Gerais, Vila Goiás, Vila Mato Grosso, Vila Espírito Santo, Vila Brasília, Vila Bahia, Vila Pernambuco, Vila Rio Grande do Norte, Vila Sergipe, Vila Alagoas, Vila Piauí, Vila Ceará, Vila Paraíba, Vila Acre, Vila Maranhão, Vila Pará, and Vila Amazonas.



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¹³ Location of the Municipality of Serra do Mel. Source: Cartographic base (IBGE, 2018). Available at: https://www.researchgate.net/figure/Figura-1-Localizacao-do-Municipio-de-Serra-do-Mel-Fonte-Base-cartografica-IBGE-2018_fig1_334494680.

The colonization process of Serra do Mel began in 1970, during the government of José Cortez Pereira de Araújo, with effective implementation in 1972. The colonization project was concluded in 1982, with the occupation of almost all rural villages. Its planning was based on the Israeli *moshav* model, focused on cooperative rural development.¹⁴ The objective was to grant 50-hectare plots to small farmers to cultivate cashew trees in combination with other subsistence crops. The project also sought to absorb labor from workers affected by the mechanization of nearby saltworks.

On May 13, 1988, through Law No. 803, Serra do Mel obtained political autonomy, with its territory separated from the municipalities of Assu, Areia Branca, Carnaubais, and Mossoró, becoming a new municipality in Rio Grande do Norte.

To understand the social impacts of the wind industry in Serra do Mel, it is essential to first understand the local reality. The municipality is one of the poorest in Rio Grande do Norte, which, in turn, is one of the poorest and most unequal states in Brazil, according to data from the 2021 National Household Sample Survey (PNAD-Contínua). The following data illustrate this context:

Rio Grande do Norte

- Total area: 52,809.599 km² (equivalent to 0.62% of the national territory)
- Population: 3.3 million inhabitants (2018)
- Municipalities: 167
- Human Development Index (HDI) 2010: 0.684 (16th out of 27)
- Gini Index: 0.587 (2021)
- School attendance (ages 6–14): 99.5% (2022)

¹⁴ GRANJEIRO; PEREIRA; OLIVEIRA; MEDEIROS; CUNHA. Profile of Family Honey Producers in the Municipality of Serra do Mel – RN. *Revista Verde de Agroecologia e Desenvolvimento Sustentável*, Mossoró, v. 3, n. 4, p. 29–41, Oct./Dec. 2008. Available at: https://www.researchgate.net/publication/265249094_PERFIL_DOS_PRODUTORES_FAMILIARES_DE_MEL_NO_MUNICIPIO_DE_SERRA_DO_MEL_-RN. Accessed on 24 Oct. 2025.

- IDEB (2023) – Public education, early grades: 4.8 (25th of 27); final grades: 3.7 (27th of 27)
- Infant mortality: 44.8 deaths per 1,000 live births
- Access to water supply: 79.7%; sewage network coverage: 30.2%; sewage treatment: 29.8% (National Sanitation Information System – SNIS, 2023)

Serra do Mel

- Total area: 620.241 km²
- Population: 13,091 (2022) — ranked 2,500th in Brazil and 41st in the State
- HDI (2010): 0.614
- School attendance (ages 6–14): 98.19% (2022)
- IDEB (2023) – Public elementary education, early grades: 4.4 (5,022nd among 5,571 Brazilian municipalities; 113th of 167 in the State); final grades: 3.5 (5,091st nationally; 110th statewide)
- Infant mortality: 9.01 deaths per 1,000 live births (3,279th nationwide; 80th in the State)
- Water and sewage system coverage: 0.38% (5,276th nationwide; 163rd in the State)

4. The Arrival of Wind Energy in Serra do Mel

Wind energy generation in Serra do Mel began in 2015, when the first wind farms entered into operation.¹⁵ However, most of the projects — 26 out of the 36 currently operating — only obtained operating licenses starting from 2020.

For the implementation of wind power projects, it is essential that the company holds either possession or ownership of the land where the wind turbines and associated infrastructure will be installed. The method chosen by Voltalia Energia do Brasil Ltda., a company fully controlled by the French multinational Voltalia S/A, was to enter into land-use assignment contracts with local rural landowners.

In practice, rural properties were leased or ceded to the company for the installation of wind turbines, the opening of roads, and the construction of substations and transmission lines.

At present, the municipality has an installed generation capacity of 1.2 GW, representing 11.52% of the total installed capacity in the State of Rio Grande do Norte. There are currently 36 operating wind farms, with a total of 360 wind turbines distributed across 13 villages, namely: Vila Amazonas, Vila Pará, Vila Acre, Vila Piauí, Vila Maranhão, Vila Ceará, Vila Rio Grande do Norte, Vila Paraíba, Vila Alagoas, Vila Sergipe, Vila Espírito Santo, Vila Guanabara, and Vila Mato Grosso. Below is the map of Serra do Mel showing the location of each operating wind power project.

¹⁵ JACINTO, Magnólia Erivania Moura; BESERRA, Fábio Ricardo Silva. Wind Energy and Its Arrival in the Municipality of Serra do Mel (RN). *Revista Pantaneira*, v. 24, 2024. Available at: <https://periodicos.ufms.br/index.php/revpan/article/download/21335/14329>. Accessed on 24 Oct. 2025.

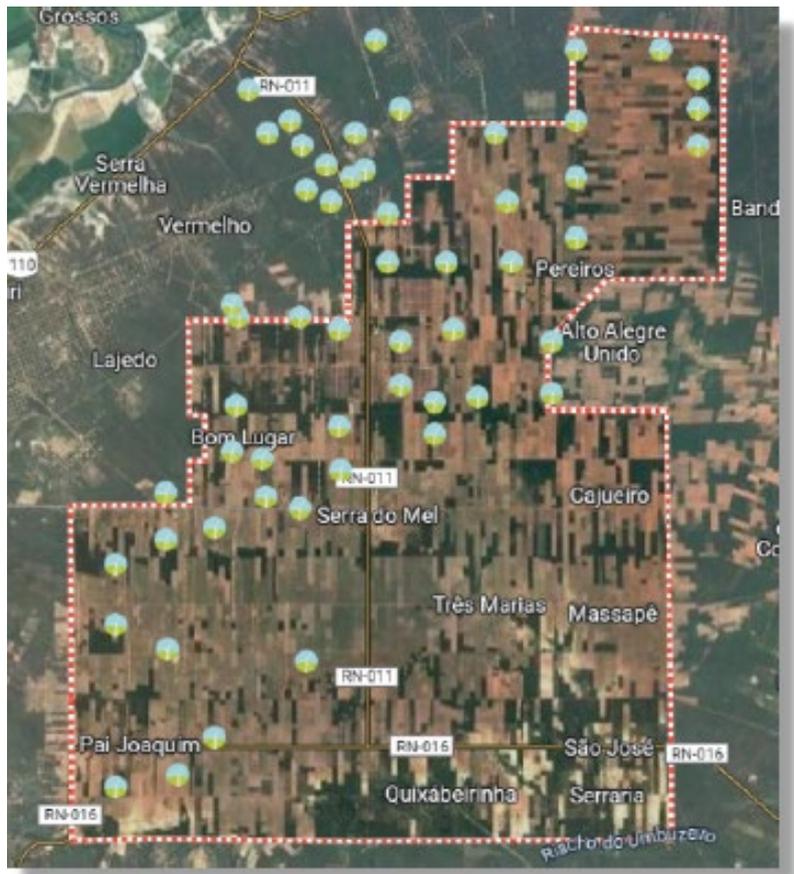


Figure 2 – Map of wind farm projects in Serra do Mel.

5. Human Rights Violations in the Community of Serra do Mel

Voltalia S/A violated the human rights of the community of Serra do Mel, first by failing to conduct an Environmental Impact Assessment (EIA) together with an Environmental Impact Report (RIMA) in relation to the wind farms projects in the region before their implementation and operation.

The absence of these studies contradicts responsible business conduct, as it prevents the identification of risks to human rights within the community and the adoption of mitigation and compensation measures for the risks or damages identified. It also prevents an effective process of community participation prior to the implementation of the projects.

As a result, risks were not identified, and preventive measures to avoid the harms suffered by the community during the construction and operation of the wind farms were not adopted. Consequently, the local population was not adequately informed or prepared for the impacts they would face.

Secondly, Voltalia S/A established an unfair model of land-use assignment contracts with rural producers, which contained abusive clauses and proved to be excessively burdensome for those who signed them.

5.1. Strategy of Fragmentation and Absence of Environmental Impact Assessment / Environmental Impact Report

Voltalia S/A fragmented its wind power complex in Serra do Mel into 40 separate units. By doing so, the company established multiple Special Purpose Entities (SPEs) to manage each individual project. This fragmentation artificially reduced both the polluting potential and the scale of the overall enterprise, thereby exempting the company from submitting the Environmental Impact Assessment (EIA) and the Environmental Impact Report (RIMA).

- The Environmental Impact Assessment (EIA) is a technical and scientific document prepared by a multidisciplinary team, whose purpose is to identify, predict, and evaluate the effects a project may cause, and to propose measures to avoid or minimize socio-environmental damages, maximize positive impacts, and establish compensatory actions.
- The Environmental Impact Report (RIMA) is a summary of the EIA, written in accessible language, and serves as the basis for public consultation. During public hearings, the affected community and the public are able to express opinions, ask questions, and propose improvements to the project — ensuring transparency and public participation in the environmental licensing process.

The National Environmental Council (CONAMA) Resolution No. 01/1986¹⁶ establishes that submission of an EIA/RIMA is mandatory for electric power plants above 10 MW. Meanwhile, CONAMA Resolution No. 462/2014¹⁷ stipulates that “the environmental licensing of wind energy projects considered to have low environmental impact shall be carried out through a simplified procedure,” thereby exempting them from the EIA/RIMA requirement.

Thus, the fragmentation of the project served the purpose of circumventing the obligation to submit an EIA/RIMA, resulting in underestimated assessments of environmental impacts, lack of transparency, ineffective public consultation, and the fragmentation of community interests.

5.2. Health Impacts

The absence of an EIA/RIMA prevented Voltalia S/A from identifying the minimum safe distance that wind turbines should maintain from residential areas to protect the health and safety of the local population.

¹⁶ BRAZIL. National Environmental Council (CONAMA). Resolution No. 001 of January 23, 1986. Establishes definitions, responsibilities, basic criteria, and general guidelines for the use and implementation of the Environmental Impact Assessment as one of the instruments of the National Environmental Policy. Brasília, DF: CONAMA, Jan. 23, 1986. 5 p. Available at: <https://www.ibama.gov.br/sophia/cnia/legislacao/MMA/RE0001-230186.PDF>. Accessed on 24 Oct. 2025.

¹⁷ BRAZIL. National Environmental Council (CONAMA). Resolution No. 005 of January 15, 1987. Amends Article 11 of CONAMA Resolution No. 001/86. Brasília, DF: CONAMA, Jan. 15, 1987. 1 p. Available at: https://conama.mma.gov.br/?option=com_sisconama&task=arquivo.download&id=677. Accessed on 24 Oct. 2025.

Scientific studies indicate that noise and infrasound emitted by wind turbines can have negative effects on human health. Among the potential symptoms are increased blood pressure, tachycardia, sleep disturbances, nausea, headaches, hearing loss, migraines, dizziness, anxiety disorders, and panic attacks.

The movement of turbine blades may also cause the stroboscopic effect — a visual disturbance capable of deteriorating mental health in individuals living near wind turbines. When these symptoms are associated with proximity to wind farms, the condition is referred to as Wind Turbine Syndrome (WTS).¹⁸

Despite the scientifically proven risks to human health, Voltalia S/A failed to plan for a safe distance between the turbines, and the residences of Serra do Mel.

The levels of noise and vibration, which determine a safe distance, can vary depending on several factors — including the turbine model, generation capacity, number of turbines, and wind speed. Some studies suggest minimum distances of 1,700 meters for smaller and less powerful turbine models than those installed in Serra do Mel.¹⁹

In the State of Pernambuco, a Bill No. 1.605/24 is under consideration in the Legislative Assembly, establishing, among other provisions, a minimum distance of 2,000 meters between turbines and residences.²⁰



Source: Reproduction.

¹⁸ PIERPONT, Nina. *Wind Turbine Syndrome: Noise, Shadow Flicker, and Health*. Santa Fe, NM: K-Selected Books, 2009.

¹⁹ COUTINHO, José Régis Vieira. *Analytical Aspects of the Study of Impacts Generated by Wind Turbine Noise and Structures*. State University of Ceará (Undergraduate Thesis), 2012.

²⁰ PERNAMBUCO. Legislative Assembly. Bill No. 1605/2024. Establishes criteria for the installation of wind power projects in Caatinga areas within the State of Pernambuco. *Official Gazette of the State of Pernambuco*, Recife, Feb. 20, 2024. Available at: <https://bancodeleis.unale.org.br/Arquivo/Documents/6/PLO/PLO16052024.pdf>. Accessed on 24 Oct. 2025.

According to georeferenced data provided by the Georeferenced Information System of the Electric Sector (SIGEL) for Serra do Mel, some turbines are located as close as 215 to 260 meters from residential dwellings.

Village	Wind Farm Project	Distance to nearest residence
Vila Amazonas	Caiçara I	2.67 km
	Caiçara II	1.13 km
	Junco I	3.4 km
	Junco II	2.75 km
	Vila Amazonas V	0.709 km
Vila Pará	Vila Pará I	0.639 km
	Vila Pará II	1.94 km
	Vila Pará III	1.87 km
Vila Acre	Vila Acre I	1.24 km
	Ventos de Vila Acre II	1.48 km
Vila Piauí	Vila Piauí I	0.772 km
	Vila Piauí II	0.785 km
	Vila Piauí III	2.1 km
Vila Maranhão	Vila Maranhão I	0.628 km
	Vila Maranhão II	0.584 km
Vila Ceará	Ventos de Vila Ceará I	0.495 km
	Ventos de Vila Ceará II	0.359 km
Vila Rio Grande do Norte	Vila Rio Grande do Norte I	0.641 km
	Vila Rio Grande do Norte II	3.12 km
Vila Paraíba	Ventos de Vila Paraíba I	2 km
	Ventos de Vila Paraíba II	2 km
	Vila Ceará I	1.86 km
	Vila Maranhão III	1.1 km
Vila Alagoas	Vila Alagoas II	0.728 km
Vila Sergipe	Vila Sergipe I	1.86 km
	Vila Sergipe II	1.25 km
	Vila Sergipe III	0.955 km
Vila Espírito Santo	Vila Espírito Santo I	1.87 km
	Vila Espírito Santo II	0.607 km
	Vila Espírito Santo III	0.305 km
	Vila Espírito Santo IV	2.82 km
	Vila Espírito Santo V	0.215 km
Vila Guanabara	Potiguar B31	0.907 km
	Potiguar B32	0.436 km
	Potiguar B33	0.260 km
Vila Mato Grosso	Ventos de Vila Mato Grosso I	0.687 km

Table 1 – Distance of wind turbines based on SIGEL data.

The practice adopted by Voltalia S/A contrasts with its projects in France, where, for instance, the Sud-Vannier Wind Farm Project observed a minimum distance of 1,260 meters.²¹

The absence of a specific or adequate regulatory framework on this issue does not exempt companies from acknowledging and addressing scientific evidence that recognizes the health risks associated with turbine proximity.

The identification and assessment of risks is a core requirement of responsible business conduct, in compliance with human rights standards.²²

Data from medical consultations in Serra do Mel, extracted from the Primary Care Health Information System (SISAB)²³ between 2017 and 2024, reveal a significant increase in cases related to symptoms consistent with Wind Turbine Syndrome.

Health records classified under the International Classification of Diseases (ICD) and the International Classification of Primary Care (ICPC) were grouped into three categories according to their proximity to WTS symptoms: (1) hearing disorders and hearing loss; (2) sleep disorders; and (3) anxiety and panic disorders.

From this grouping, a sharp increase in medical consultations was observed starting in 2022, the year when most of the wind farms became operational — particularly in cases of anxiety and panic disorders, which reached unprecedented levels in the region. The following chart, based on SISAB data, illustrates this trend:

²¹ ENERGIES DU SUD-VANNIER. Étude d'impact environnemental du Parc Éolien Sud-Vannier – Communes de Belmont et Tornay. Fontain: Opale Énergies Naturelles, déc. 2017.

²² A bill (No. 1.650/2024) currently under consideration in the Legislative Assembly of Pernambuco establishes a minimum distance of 2,000 meters between wind turbines and residential buildings. See PERNAMBUCO. Legislative Assembly. Bill No. 1605/2024 (cit.). Accessed on 24 Oct. 2025.

²³ BRASIL. Ministério da Saúde. Sistema de Informação em Saúde para a Atenção Básica. Disponível em: sisab.saude.gov.br. Acesso em 19/03/25.

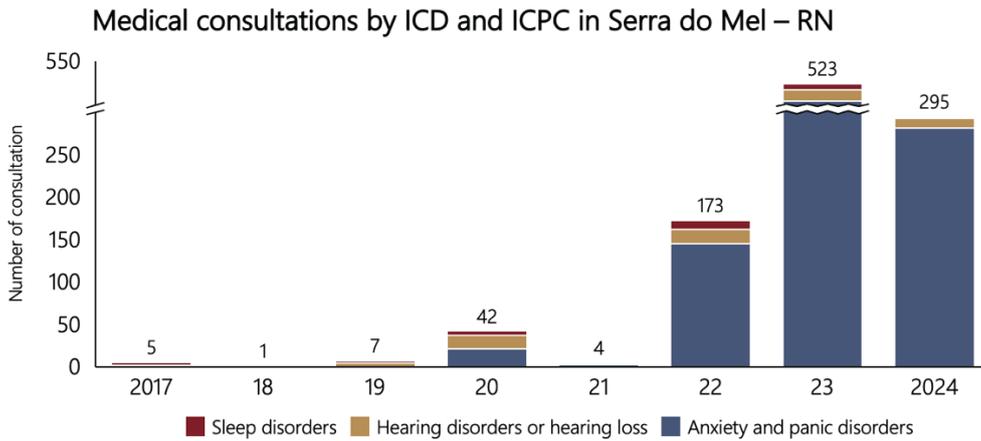


Table 2 – Chart prepared from SISAB data, grouped by type of medical consultation. ²⁴

For comparison, the same data were collected for the municipality of Poço Branco (RN), which has similar characteristics to Serra do Mel but no operating wind farms. In Poço Branco, the number of consultations was higher in 2020 and 2021 but declined afterward, whereas in Serra do Mel, the opposite occurred — a sharp rise in 2022 and 2023.

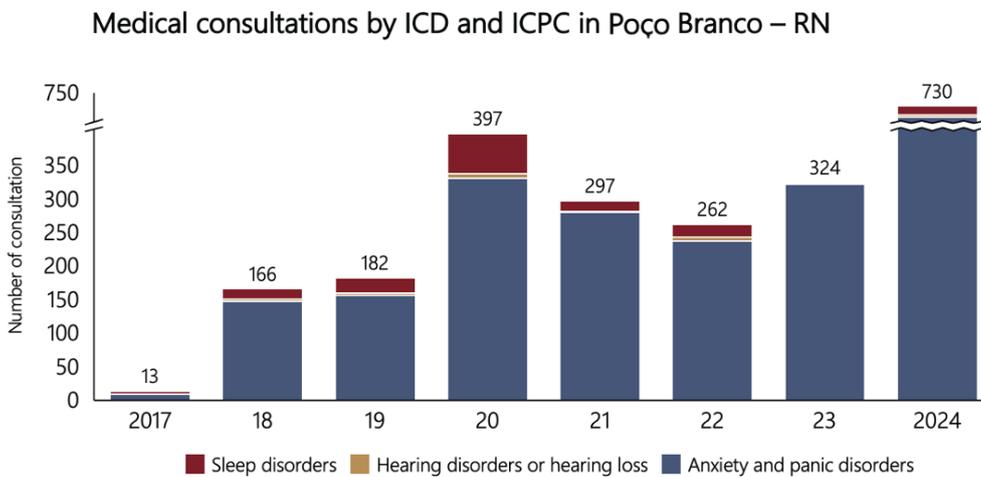


Table 3 – Chart prepared from SISAB data, grouped by type of medical consultation. ²⁵

The distinct patterns observed between the two municipalities provide strong evidence that the significant increase in consultations in Serra do Mel in 2022 and 2023 may be directly related to the beginning of most wind farm operations.

²⁴ Sleep disorders: ICD: G47, G478, G479; ICPC: Po6. Hearing disorders and hearing loss: ICD: H83, H833, H838, H839, H90, H91; ICPC: Ho1, Ho2, Ho3, H99. Anxiety and panic disorders: ICD: F41, F410, F411, F418, F419; ICPC: Po1

²⁵ *idem*

5.3. Environmental Impacts

Voltalia S/A completely altered the landscape of an entire municipality, distributing wind turbines throughout the region. This process involves the deforestation of native vegetation and the construction of access roads, further transforming the natural environment.

By fragmenting the wind power complex into 40 different projects, each subjected to individual and simplified licensing procedures, and without an assessment of cumulative or synergistic impacts, as required by CONAMA Resolution No. 462/2014, Voltalia S/A failed to establish any ecological corridors in the area, thereby disrupting the habitats of native fauna.

The noise and vibrations emitted by wind turbines can also provoke the displacement of bees (*Anthophila*) — a phenomenon known as bee flight or abandonment — which may negatively affect both beekeeping activities and subsistence crops, since bees are essential for pollination.

5.4. Social Impacts

The contract model adopted by Voltalia S/A has had a significant impact on the social rights of family farmers in the region. This is because the company requires the lease of 100% of land possession from these rural workers for periods ranging from 35 to 50 years.

Under this model of land-use assignment or lease exceeding 50% of possession, farmers lose their legal status as special insured persons, which prevents their retirement as family farmers and restricts access to public policies and special lines of rural credit available to this category.

The contracts were signed without the presence of independent legal counsel, meaning that many vulnerable producers were not properly advised and did not understand the potential consequences of these agreements.

During the construction phase of the wind farms, the need to open roads and the usage of heavy machinery can severely impact agricultural production, due to vegetation suppression and the generation of dust, both of which may affect crop quality.

5.5. Economic Impacts

The land-use assignment contract model imposed by Voltalia S/A establishes an unfair compensation structure: remuneration is calculated as a percentage of the company's revenue, which effectively transfers part of the economic risk of the enterprise to the rural producers.

Thus, any failure or interruption in energy generation directly affects the income of family farmers. Reports over the past few years indicate a significant decline in remuneration received by these producers.

Moreover, there is a lack of transparency: the energy generated by Voltalia S/A is sold both in the Regulated Contracting Environment (ACR) and in the Free Contracting Environment (ACL), with no detailed disclosure of the revenue generated in each market — preventing verification of the accuracy and fairness of payments.

The contracts also include the figure of a middleperson referred to as an “intermediary lawyer”, responsible for managing the contractual relationship and providing legal services. This intermediary receives 7.5% of the producers' income, deducted at the source by the company and transferred directly to the intermediary, on a permanent and hereditary basis.

Each land use assignment contract is signed individually with each farmer. The assignor (the rural producer who signs the contract) receives an ideal quota of the company's revenue percentage corresponding to the village where they reside, regardless of whether turbines are installed on their property or not. Because the number of turbines varies across villages, energy generation — and consequently, remuneration — is unevenly distributed, which fosters community division. Those who did not sign the agreements receive no compensation whatsoever, despite bearing the environmental and health impacts caused by the projects.

But ultimately, did the installation of wind farms bring any positive economic effects to the region?

6. Economic Impact

The impact of wind farms on the local economy of Serra do Mel is limited, essentially restricted to the municipality's share of ICMS revenue (a value-added tax on the circulation of goods and services). There is virtually no local job creation or income distribution, which means that poverty levels remain unchanged, while the adverse effects on other economic activities have been amplified.

6.1. Tax Exemptions

Wind energy projects benefit from multiple tax exemptions, although not all related data are publicly available for social oversight. For instance, information on tax waivers for equipment and infrastructure under the PROINFA Program is difficult to trace, making it impossible to quantify the total public investment involved.

However, available data indicates substantial public investment in the development of the sector. Illustrative in this regard are figures from the Special Regime for Incentives for Infrastructure Development²⁶ (REIDI), which grants federal tax exemptions related to social security contributions. Data collected from only 17 wind farms show that, through REIDI, Voltaia obtained approximately R\$ 256 million in tax exemptions.

²⁴ BRAZIL. Ministry of Integration and Regional Development (MIDR). REIDI. Brasília, DF, Nov. 22, 2021. Updated 2021. Available at: <https://www.gov.br/mdr/pt-br/assuntos/fundos-regionais-e-incentivos-fiscais/reidi>. Accessed on 24 Oct. 2025.

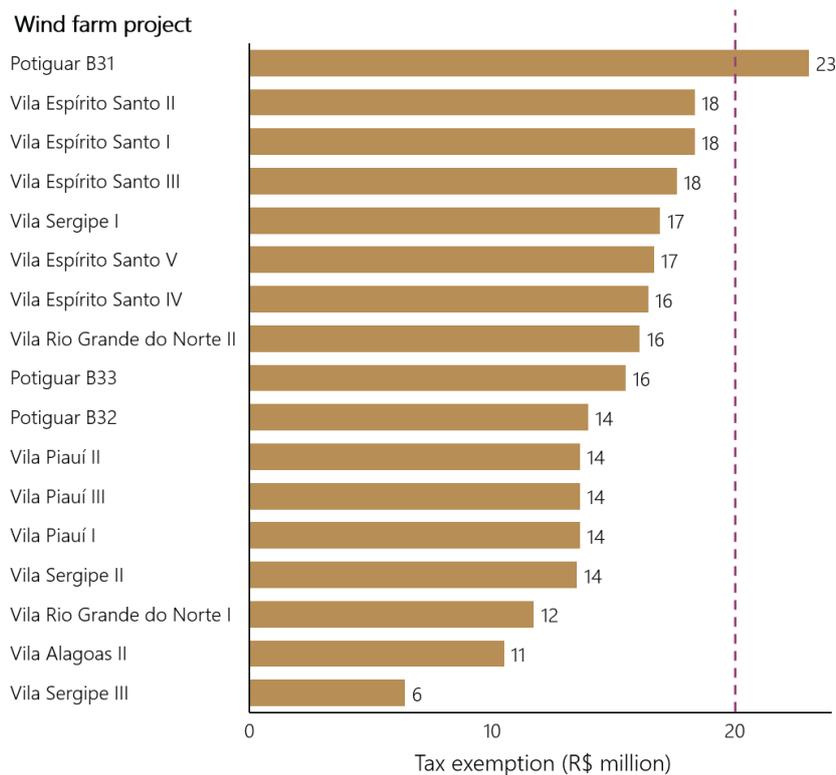


Table 4 – Estimated tax exemptions per project.

Such large-scale state investment, the total amount of which remains unknown due to lack of transparency, cannot disregard the socioeconomic impacts on communities that are already in situations of vulnerability, such as Serra do Mel. The energy transition, though necessary, can only be just if it recognizes and prioritizes the rights and dignity of affected populations.

6.2. Municipal ICMS Revenue

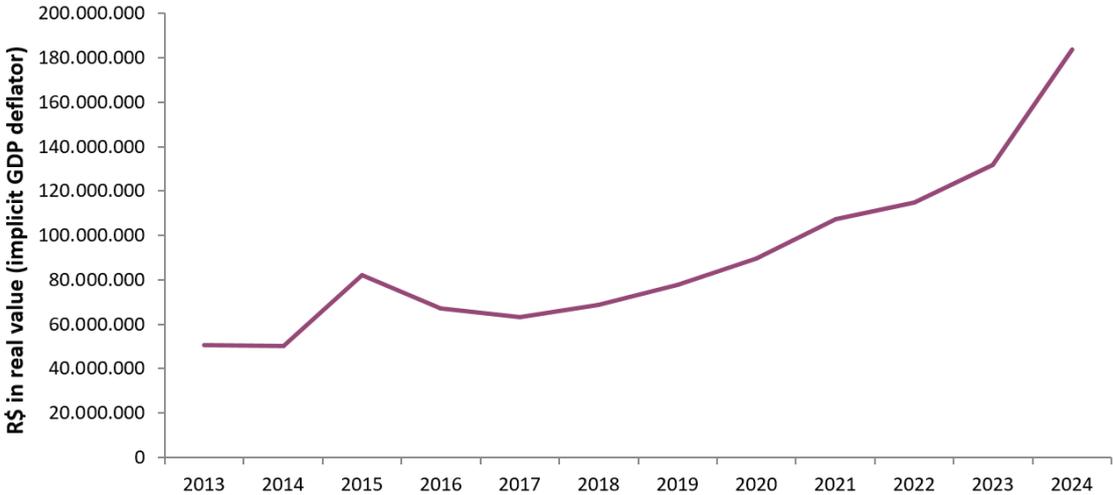
The sale of wind-generated electricity in Serra do Mel is subject to the Tax on the Circulation of Goods and Services (ICMS), part of which is transferred to the municipality. Municipal budget data show that increases in revenue coincide with the start of wind farm operations, particularly during 2015 and 2020.

The graphs below show the evolution of municipal revenue over time. The second graph compares Serra do Mel’s budgetary growth with that of Brazil as a whole, highlighting

²⁷ Source: Carvalho, C.C. (2025).

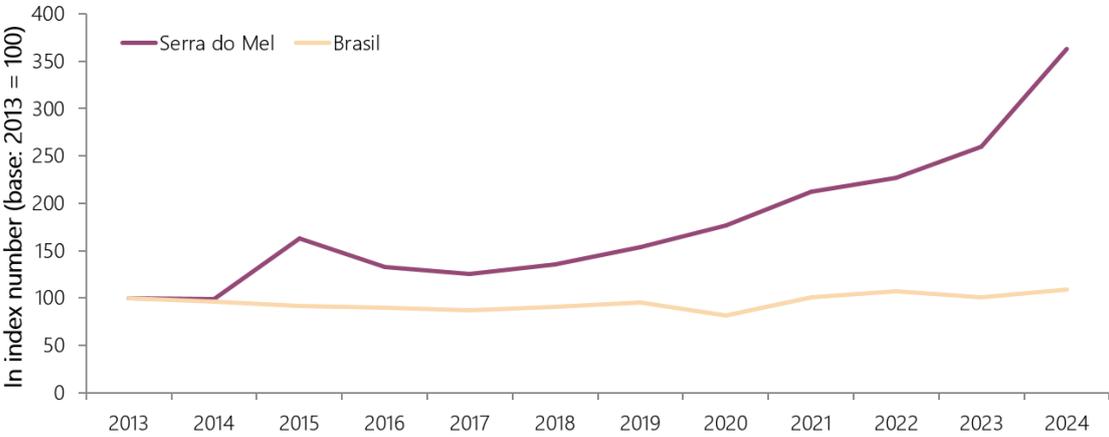
the relative increase in local revenue and the municipality’s growing dependence on the wind power industry — and, consequently, the industry’s expanding influence.

Gross realized revenues – Serra do Mel (RN)



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Budget revenues: Serra do Mel (RN) vs. Brazil



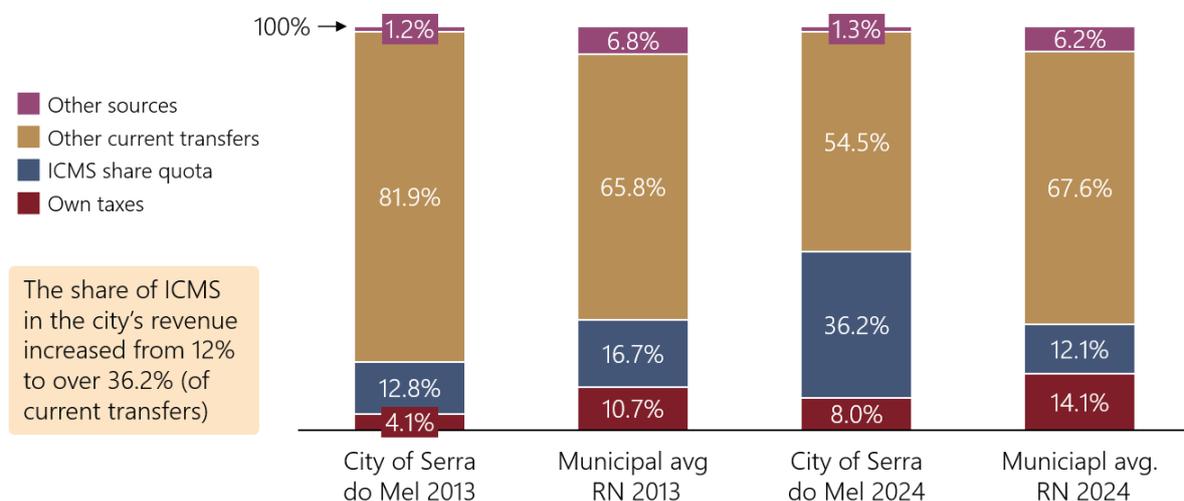
29

In absolute terms, Serra do Mel’s ICMS share increased from 12.8% in 2013 to 36.2% in 2024, as shown in the table below. However, this variation has had little to no effect on the dynamization of the local economy. The population remains poor and dependent on federal income transfer programs.

²⁸ Source: Siconfi and IBGE. Prepared by: DIEESE/CUT Brazil Subsection

²⁹ *idem*

Structure of budget revenues: Serra do Mel (RN) vs. municipal average of RN, (%)



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6.3. Social Benefits Received in Serra do Mel

In Brazil, access to federal social benefits, such as the Bolsa Família program, requires prior registration in the Unified Registry (CadÚnico) — the federal database used to identify and include vulnerable families in social programs. This registry gathers information such as household composition, education, employment, and income status.

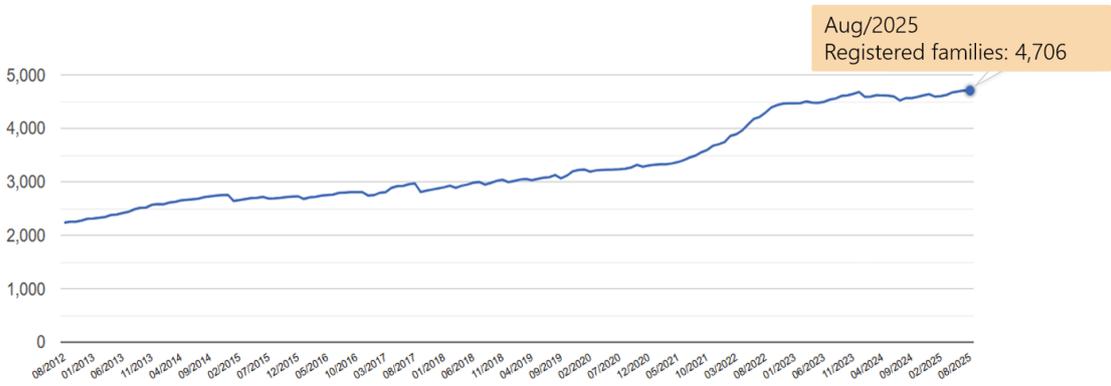
According to CadÚnico data, the number of registered families in Serra do Mel has steadily increased since 2013, with a notable rise from 2020 onward.³¹ Currently, there are 4,706 registered families, totaling 11,682 individuals in vulnerable situations, which represents 84.2% of the municipality's population, considering the 2025 projected population of 13,819.

³⁰ Source: Siconfi and IBGE. Prepared by: DIEESE/CUT Brazil Subsection

³¹ BRAZIL. Ministry of Social Development, Family and Fight Against Hunger (MDS). Secretariat for Evaluation, Information Management and Single Registry (SAGICAD). Total Number of People Registered in the Single Registry – Serra do Mel/RN. [s.l.], [2025?]. Interactive dashboard. Available at: <https://aplicacoes.cidadania.gov.br/vis/data3/v.php?q%5b%5d=oNOclsLerpibuKep3bV%2Bgmhj05Kv3KavyuDAsljEsao%3D&ag=m&codigo=241335>. Accessed on 24 Oct. 2025.

These data show that, despite the arrival of the wind energy industry in the region, the poverty situation of the population has worsened. This seems to indicate that the financial resources derived from wind energy generation do not circulate locally, nor do they benefit the community directly affected by the installation and operation of the wind farms.

Serra do Mel (RN): Number of families registered in the Unified Registry (CadÚnico)



Source: Social Information Matrix (SENARC/SAGI) – MDS

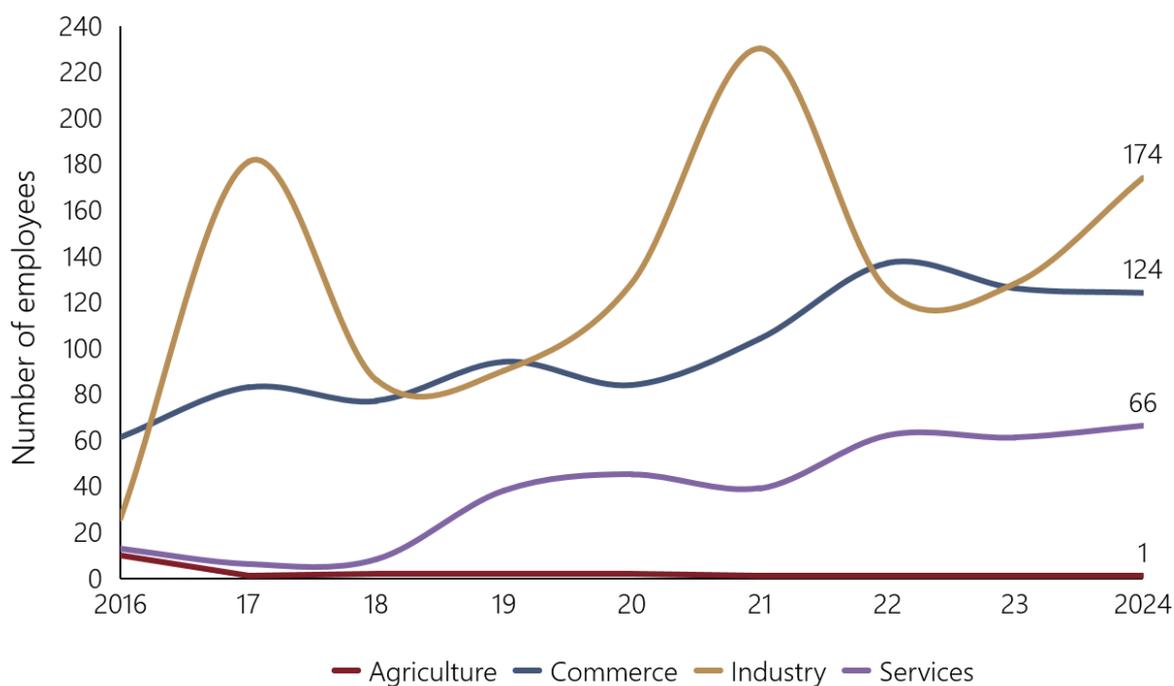
Table 4 – Number of families registered in the Unified Registry (CadÚnico).³²

This interpretation is reinforced by figures from the Bolsa Família program itself. In October 2025, 2,829 families in Serra do Mel received Bolsa Família benefits. Assuming that each family is composed of at least two to three people, it is estimated that more than seven thousand individuals are covered by the program — representing approximately 60% of the municipality’s total population.

6.4. Lack of Job opportunities

Job opportunities in the wind energy industry occurs almost exclusively during the installation phase and is therefore temporary (lasting between 6 and 18 months). Data from the Sebrae Sectoral Observatory show that spikes in employment in the industrial sector coincide precisely with construction periods.

³² Data source: Social Information Matrix (SENARC/SAGI/MDS). Organized by: Dieese/ CUT Brasil.



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The jobs are typically low-wage positions, such as general service assistants, bricklayers, security guards, and retail workers. Once operational, wind farms can be remotely managed, leading to the closure of local construction-related jobs and a slowdown of the local economy.

This reality is confirmed by data from the Annual Social Information Report (RAIS) of the Ministry of Labor and Employment (MTE). Tables for 2022 and 2023 list the most common occupations and the number of formal jobs by economic subsector, along with average income.

The sectors that employ the most people in Serra do Mel are public administration, technical and professional services, and retail trade (food and beverages). The wind industry does not appear among major employers. In the list of nearly 1,400 formal jobs, only three correspond to the electricity and communications subsector.

³³ SEBRAE. Evolution of Employees by Economic Sector [Graph]. In: Territorial Sectoral Observatory – Brazil. [Serra do Mel]: Sebrae, 2024. Available at: <https://observatorio.sebrae.com.br/profile/geo/serra-do-mel?redirect=true&selector5oid=employeesOption>. Accessed on 24 Oct. 2025.

Occupational subgroup	2023	2022
Service workers	334	301
Bookkeepers	215	202
Education professionals	120	140
Workers in transversal functions	102	136
Workers in the extractive and construction industries	79	189
Social and human sciences professionals	67	24
Sales and commerce service providers	64	64
Public service workers	50	52
Mid-level technicians in physical, chemical, engineering, and related sciences	49	53
Mid-level technicians in administrative sciences	47	51
Others	189	258
Total	1.316	1.470

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Table 5 – Most frequent occupations in Serra do Mel - RN

IBGE Subsector	Frequency	Avg income (R\$)
Mechanical industry	23	9,484.82
Electrical and communication	3	7,464.01
Public utility services	1	8,720.20
Civil construction	51	2,727.81
Financial institution	2	2,578.03
Public administration	617	3,632.31
Agriculture	1	1,905.90
Transport and communications	16	1,803.07
Technical and professional administration	368	1,793.02
Medical, dental, and veterinary professionals	1	1,840.89
Retail trade	126	1,363.42
Food and beverages	96	1,293.32
Lodging and communication	6	1,070.48
Wood and furniture	1	1,500.00
Metallurgical industry	1	n.a.
Paper and printing	2	n.a.
Education	1	n.a.
Total	1,316	2,759.10

National average:
R\$ 3,348.83 –
Serra do Mel was
17.6% lower

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Table 6 – Number of formal employment contracts and average income

³⁴ Data source: RAIS/MTE. Organized by: DIEESE/CUT Brasil

³⁵ *idem*

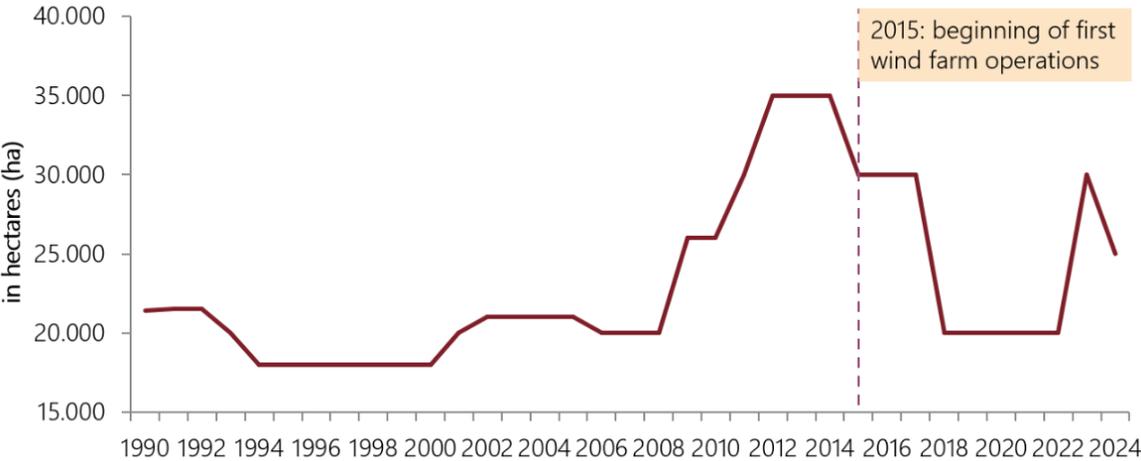
6.5. Decline in Agricultural and Livestock Production

The construction of wind farms requires the opening of roads for transporting turbine components and the creation of substations to connect the generated power to the National Interconnected System (SIN). This infrastructure, though essential for energy transmission, leads to the exclusion of portions of local territory from other economic uses.

Moreover, changes in the local geographic landscape have negatively affected agricultural production. Altered wind flow patterns interfere with the flight of birds and insects, disrupting their ecological roles. The noise and vibration from turbines repel bees, harming pollination of cashew trees and honey production. Dust emissions from the turbines reduce photosynthesis efficiency, thereby affecting cashew fruit yields.

The two graphs below show: (1) a reduction in cultivated land area following the beginning of wind energy generation, and (2) a historical comparison of Gross Value Added (GVA) at constant prices from 2006 to 2021.³⁶

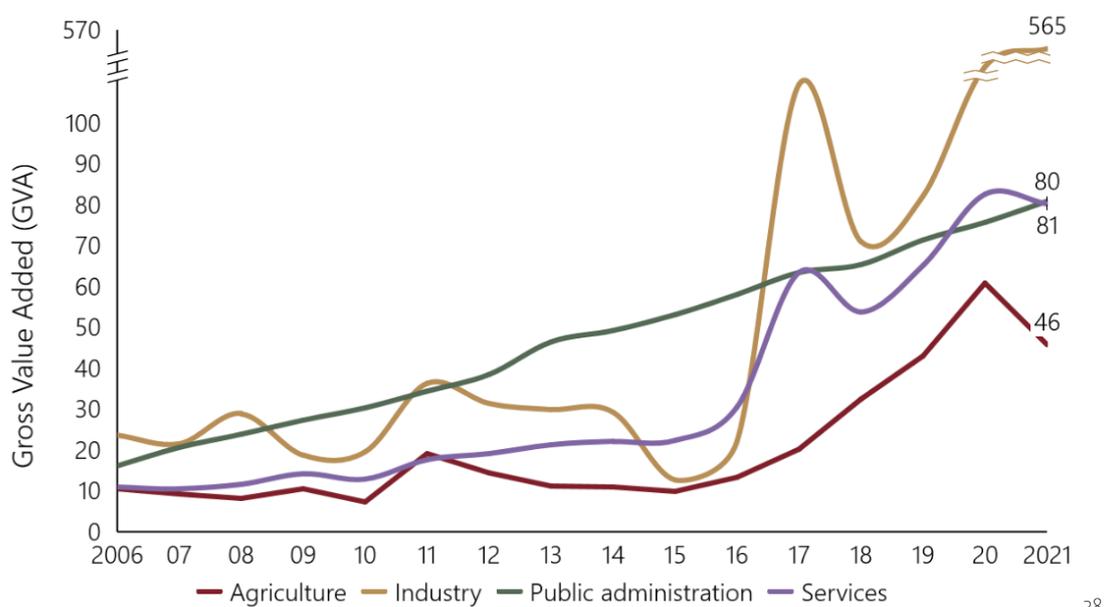
Hectares (ha) allocated to cashew nut cultivation in Serra do Mel (RN)



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³⁶ JÚNIOR, Manoel Fortunato Sobrinho. Perception of the Socioeconomic and Environmental Impacts of Wind Farms in Agricultural Areas: A Case Study of the Municipality of Serra do Mel-RN. 2020. 118 f. Master's Thesis (Environment, Technology and Society) – Federal Rural University of the Semi-Arid Region (UFERSA), Mossoró, 2020. Available at: <https://repositorio.ufersa.edu.br/handle/prefix/5643>. Accessed on 24 Oct. 2025.

³⁷ Source: Municipal Agricultural Production (PAM) – IBGE. Source: Municipal Agricultural Production (PAM) – IBGE. Organized by Dieese/CUT Brasil.



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6.6. The Sale and Purchase of Electricity

In Brazil, electricity is traded in two distinct markets with unequal rules and conditions: the Regulated Contracting Environment (ACR) and the Free Contracting Environment (ACL). The table below summarizes their differences:

	Regulated Contracting Environment (ACR)	Free Contracting Environment (ACL)
Participants	Generators and distribution companies	Generators and large consumers
Consumers	Low-voltage consumers, such as households, commercial establishments, and public institutions	Large consumers, such as industries, factories, and shopping centers — minimum consumption of 500 kW
Contracting	Energy auctions promoted by the CCEE	Free negotiation between buyers and sellers
Type of Contract	Regulated by ANEEL	Freely negotiated
Price	The energy price is established in the auction, and the resale/distribution price is regulated by ANEEL (R\$ 307.29/MWh in 2025)	Price agreed between seller and buyer (R\$ 150.00/MWh in 2025)
Subsidies	All electricity sector surcharges are borne by consumers (CDE, PROINFA, tariff flags, etc.)	Consumers are exempted from surcharges and tariff flags

³⁸ SEBRAE. Evolution of Employees by Economic Sector [Graph]. In: Territorial Sectoral Observatory – Brazil. [Serra do Mel]: Sebrae, 2024. Available at: <https://observatorio.sebrae.com.br/profile/geo/serra-do-mel?redirect=true&selector5oid=employee>. Accessed on 24 Oct. 2025.

In practice, the overall population consumes energy traded in the ACR, which is more expensive, whereas large corporate consumers buy energy in the ACL, at lower, unregulated prices, exempt from surcharges and subsidies. It is unfair that the population affected by wind farms pays higher prices for lower-quality energy.

In addition to the price disparity, there is no transparency regarding ACL transactions, making it impossible to trace the source of purchased energy.

A study by Cássio C. Carvalho of the Institute for Socioeconomic Studies (INESC) found that, among 19 analyzed wind farms, 222.7 MWm (77.25%) were allocated to the ACR, while 65.6 MWm (22.75%) went to the ACL. However, energy produced by 17 other wind farms — Potiguar B31, B32, B33; Vila Alagoas II; Vila Espírito Santo I–V; Vila Piauí I–III; Vila Rio Grande do Norte I–II; and Vila Sergipe I–III — is entirely allocated to the ACL, totaling 646.08 MW of installed capacity, equivalent to 54.93% of Serra do Mel’s 1,176 MW wind complex.

Wind Farm	Physical Guarantee (MWm)	Sold in ACR (MWm)	% Sold in no ACR	Auction
Caicára II	9.6	9.3	96.9%	2011/7
Ventos de Vila Paraíba I (former Vila Paraíba III)	18.8	17.9	95.2%	2017/4
Vila Acre I	15.2	14.4	94.7%	2015/9
Ventos de Vila Acre II	16.6	15.5	93.4%	2017/5
Caiçara I	14.6	13.5	92.5%	2011/7
Junco I	13.1	12.1	92.4%	2011/7
Vila Paraíba II	19.2	17.7	92.2%	2017/4
Junco II	13.3	11.4	85.7%	2011/7
Vila Pará I	14.2	11.8	83.1%	2013/10
Ventos de Vila Ceará II	18.8	15.4	81.9%	2017/5
Ventos de Vila Paraíba I (former Vila Paraíba III)	19.9	15.8	79.4%	2017/5
Vila Pará II	14.0	10.6	75.7%	2013/10
Vila Pará III	13.9	10.5	75.5%	2013/10
Vila Amazonas V	14.8	10.5	71.0%	2013/10
Vila Ceará I	13.4	8.2	61.2%	2018/3
Vila Maranhão II	15.4	8.3	53.9%	2018/3
Vila Maranhão I	15.7	8.3	52.9%	2018/3
Vila Maranhão III	16.8	8.2	48.8%	2018/3
Ventos de Vila Mato Grosso I (former Vila Alagoas III)	11.0	3.3	30.0%	2019/3

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³⁹ Source: Carvalho, C.C. (2025), based on data from ANEEL (2025).

7. How Did the Community React?

The local community mobilized to denounce the human rights violations committed by Voltalia, considering the company's inaction and the absence of meaningful dialogue with affected residents.

Between June 2 and 7, 2024, the General Secretariat of the Presidency of the Republic held, in the State of Rio Grande do Norte, a Dialogue Roundtable entitled "Renewable Energies: Rights and Impacts", in the communities of Enxu Queimado, Lagoa Nova, and Assu. The initiative brought together dozens of residents from communities affected by wind power projects in those regions.

In the following week, the Single Workers' Central (Central Única dos Trabalhadores-CUT) organized a public hearing followed by the Seminar "Human Rights and Business: Impacts and Violations of Wind Farms in Rio Grande do Norte", during which several rural producers reported cases of rights violations in the municipality of Serra do Mel.

As a result, a popular public hearing was convened for June 25, 2024, in Serra do Mel, gathering numerous community members and stakeholders. Subsequently, hundreds of producers called for a Popular Assembly in Serra do Mel, held on July 30, 2024, during which they approved the filing of a collective lawsuit against the company, seeking full reparation for the damages suffered.

The Federation of Rural Workers and Family Farmers of the State of Rio Grande do Norte (Federação dos Trabalhadores Rurais Agricultores e Agricultoras Familiares do Estado do Rio Grande do Norte - FETARN), the Single Workers' Central (Central Única dos Trabalhadores – Rio Grande do Norte - CUT-RN), and the Rural and Urban Assistance Service (Serviço de Assistência Rural e Urbana - SAR) agreed to file a public civil action against Voltalia, which was officially submitted on May 21, 2025, requesting recognition of the damages and their full reparation.

During the proceedings, the State Public Prosecutor's Office of Rio Grande do Norte (MP-RN) issued an opinion supporting the action, recommending the preparation of

a corrective EIA/RIMA encompassing all projects and acknowledging the environmental impacts. The State Public Defender's Office (DPE-RN), through its Working Group for a Just Energy Transition (GATEJ), also joined the case as *custos vulnerabilis* — guardian of the rights of vulnerable populations.

Other organizations entered the lawsuit as *amici curiae*, reinforcing the claims made in the collective action.

In parallel, several community associations sent an official letter to the General Secretariat of the Presidency of the Republic, addressed to the Dialogue Roundtable “Renewable Energy: Rights and Impacts”, denouncing the human rights violations and requesting an on-site visit for community hearings and verification of the situation. On August 5 and 6, 2025, a multiministerial team from the government visited the area to assess the situation and is expected to publish a report on its findings.

Additionally, the organizations that filed the public civil action submitted a Specific Instance request to the Brazilian National Contact Point (NCP) under the OECD Guidelines for Multinational Enterprises on Responsible Business Conduct, alleging violations by Voltalia S/A, the French multinational.

8. What Are the Developments of the Conflict?

So far, Voltalia has refused to revise its abusive contract model and denied the existence of any damages resulting from the wind farms in the region — including the denial of Wind Turbine Syndrome, despite the scientific evidence available. Consequently, the company refuses to carry out a corrective EIA/RIMA or to compensate the affected population.

After the public civil action was filed in May 2025, certain individuals began to spread false information claiming that the lawsuit sought to expel the company from Serra do Mel, which could allegedly affect the already limited income received by some family farmers. This tactic — clearly intended to divide the community — resonated among part of the population, deepening local tensions.

As a result, the situation remains unresolved, while Voltalia continues to deny the adverse impacts and refuses to adopt measures aimed at mitigating and compensating the identified damages.

9. What Is Ultimately Being Demanded?

1. Revision of the contracts for all those who express interest, limiting land-use assignment to 50% of each plot, to preserve farmers' rights to retirement as special insured persons and to guarantee access to rural credit.
2. Fair remuneration, without transferring the economic risk of the enterprise to family farmers.
3. Preparation of a corrective Environmental Impact Assessment and Environmental Impact Report (EIA/RIMA) covering all 40 wind farm projects, ensuring community participation and the implementation of mitigation and compensation measures.
4. Adoption of reparation and mitigation measures, such as the creation of a reparation fund to be managed by the community itself, which would decide on the necessary compensation actions.
5. Provision of medical and psychological assistance to individuals reporting symptoms associated with Wind Turbine Syndrome.
6. Guarantee of transparency in contractual arrangements, including the full and accessible disclosure of information on energy sales conducted both in the Regulated Contracting Environment (ACR) and the Free Contracting Environment (ACL).

The goal is to ensure the production of a genuinely clean energy, sustainable, and respectful of the rights and dignity of communities affected by the wind power industry.

The need for an energy transition is undeniable and widely desired. What is at stake, however, is the central axis of this process, which cannot be profit, but rather the well-being and health of people and the environment.



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