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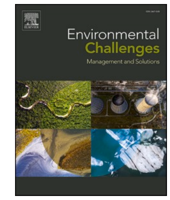

Amplifying concerns: An exploration of community noise levels in rural communities impacted by wood pellet production

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ABSTRACT

Wood pellets are increasingly promoted as a renewable and sustainable energy source, driving the global wood pellet market to a projected value of $16 billion by 2026. However, the rapid expansion of this industry disproportionately affects predominantly Black and low-income communities in the rural South, where approximately 100 pellet manufacturing plants are currently located in the United States. From August 2023 to March 2024, we conducted a noise exposure assessment in Gloster, Mississippi, a community affected by pellet production, and compared it to Mendenhall, a nearby community without industrial activity. In collaboration with a local organization, we measured noise metrics and found significantly higher A-weighted, C-weighted, and Z-weighted sound levels in Gloster, along with elevated decibels at multiple center frequencies. These findings suggest that wood pellet manufacturing can severely alter the soundscape of rural communities, raising environmental justice concerns. Our findings underscore the importance of investigating the cumulative health impacts of noise and other environmental burdens on these vulnerable communities to better inform policy.

1. Introduction

Wood pellet production has been promoted as a renewable and sustainable alternative to fossil fuels, providing economic opportunities and local job creation in rural areas. With a rapidly growing global market projected to reach $16 billion by 2026, wood pellets are used for cooking, electricity, and heating, and are increasingly seen as a key component in the transition toward cleaner energy. (EIA 2023; MordorIntelligence. WOOD PELLET MARKET - GROWTH, TRENDS 2022) The production of wood pellets involves converting wood biomass—any biomass derived from trees—into small pellets that can be efficiently transported and burned for energy. This process is especially significant in communities where the local economy benefits from new manufacturing facilities and increased export demand.

While wood pellet production offers economic benefits, it also introduces environmental challenges, particularly noise pollution from heavy machinery and increased traffic from trucks and freight trains. These emissions can propagate into nearby residential areas, raising concerns about potential health impacts and environmental justice.

1.1. *Community noise from wood pellet production*

The production process (Fig. 1) involves transporting large wood logs to manufacturing plants, where they are processed into pellets (6–8 mm in diameter, up to 40 mm in length). The pellet manufacturing process involves up to five key pieces of equipment: a log chipper to break down wood into smaller pieces; a crusher or hammermill to further pulverize the wood; a dryer (hot air, rotary, or fluidized bed) to remove moisture; a pellet mill to mold the dried wood into its final size; and a cooling system (cyclone, vibration, or rotary) to cool the pellets. Finally, a packaging machine prepares the pellets for shipment via heavy trucks or freight trains. (GemcoEnergy)

The machinery used during the wood pellet process emits high levels of sound. For example, a hammer mill produces around 100 dB (dB), while a pellet mill and vibrating screen (which separates materials by size) generate 90 dB. Fans and elevators (used to transport pellets) emit 80 dB. (GemcoEnergy) These sounds propagate into the surrounding community and are often experienced by local residents (Video 1). Further, beyond the immediate sound emissions from wood pellet plant manufacturing operations, cities and towns with plants are building more road and rail lines to keep up with export demand, which are additional sources of both community sound pollution.

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1.2. Sound pollution as an emerging environmental justice concern

Currently, there are 91 wood pellet production plants in the United States, with 75 % of the production occurring in the rural South. (EIA. Monthly Densified Biomass Fuel Report 2021) These plants are disproportionately situated in predominantly Black communities already burdened with significant economic and health disparities, raising potential environmental justice concerns. (Johnston and Cushing, 2020; Koester, 2018; Carpenter and Wagner, 2019; Bullard, 2002) Despite these risks, the environmental health impacts of wood pellet manufacturing—particularly noise pollution—have not been rigorously studied. While air pollution from these facilities has received some attention, there remains a critical gap in understanding how noise emissions affect surrounding communities, especially those that are already vulnerable. (Ramseth, 2019; Kaufman, 2021; Purifoy, 2020)

This gap is especially concerning in Mississippi, a state that consistently ranks near the bottom in national health indicators and is home to eight wood pellet plants, including two under development that are projected to be among the largest in the world (Fig. 2). (Anderson and Powell, 2018). (AECF 2021; UHF 2022; TheCommonwealthFund 2024) These facilities have the potential to emit pollutants beyond Clean Air Act limits, yet their noise pollution impact remains unstudied.

1.3. Community-Driven environmental monitoring efforts

Our study addresses this gap by providing the first comprehensive analysis of community noise levels associated with wood pellet production in two rural Mississippi communities—Gloster, impacted by multiple plants, and Mendenhall, serving as a background community without wood biomass industries (Fig. 2). This study employed community-driven and community-powered approach, collaborating with local residents and the Greater Greener Gloster Project, a non-profit organization, to measure air, sound, soil, and water quality. This research is part of a broader, ongoing longitudinal cohort study examining the health impacts of these pollutants on adolescents aged 12 to 17 in Mississippi.

By focusing on noise pollution—an overlooked environmental hazard in these communities—our study aims to fill a significant research gap and contribute to both scholarship and policy development. Specifically, this study seeks to identify the major sound sources in a wood pellet community, understand the dispersion of sound from the wood pellet plant, and determine which sound level metrics are most affected by this industry. There is also an examination of examine how these factors influence the local soundscape, including variations by time of day and the extent of noise propagation into the community, and compare these findings to a background community without industrial influence. The study highlights the need for comprehensive, localized environmental monitoring programs and underscores the importance of including community voices in environmental justice research.

2. Materials and methods

2.1. Site selection

Gloster, a rural city situated in Amite County southwestern Mississippi, close to Louisiana, occupies an area of approximately 4.72 km^2. Gloster's population, according to 2023 Census data, is 1319, with 76 % Black and 38.6 % of the population living below poverty level. (USCB 2024) Gloster is home to Amite Bioenergy pellet manufacturer, Gloster Chips, as well as other lumber and forestry support businesses. In 2020, the Mississippi Department of Environmental Quality (MDEQ) issued a $2.5 million fine for a wood pellet plant in Gloster MS, for violating its permit's annual limits on the release of VOCs. (Sharma, 2023) Following, in March 2023, MDEQ issued a second notice for violating the Clean Air Act. (Lawson, 2023) Mendenhall is also a rural city located in central Mississippi (Simpson County) and occupies a total area of 13.89 km^2. Mendenhall's population according to 2023 data is 2148, where 34 % of residents are Black, 35.8 % live in poverty, and residents have an annual median income of $35,956. (USCB 2024) Mendenhall has no wood biomass industries, making it an ideal background community. (DataUSA 2023)

2.1.1. Monitoring locations

Working closely with the community partner, Greater Greener Gloster, an exhaustive list (n = 100 in each community) of potential monitoring sites in each community was developed, selecting locations at varying distances from the wood pellet manufacturing area and considering factors such as accessibility, safety, and input from local residents. Of these sites, laboratory members and trained community residents measured sound levels at n = 95 sites in Gloster and n = 54 sites in Mendenhall (Fig. 3). Locations were selected based on several criteria, including accessibility by car, safety considerations, the frequency of traffic along travel routes, diversity in potential sound sources, and varying distances from the wood pellet plant. Sampling was confined within a 2-mile radius from the plant in Gloster and within a 2-mile radius of the city center in the background community of Mendenhall. A similar distribution of sites was maintained in both communities, with measurements taken in busy areas as well as on quieter streets to ensure a comprehensive assessment of the soundscape.

To ensure an unbiased and comprehensive sample, monitoring sites were randomly selected across different times of the day—daytime (7 a.m. to 7 p.m.), rush hour (7 a.m. to 9 a.m. and 4 p.m. to 7 p.m.), and nighttime (7 p.m. to 7 a.m.)—as well as across different days of the week, including weekdays (Monday to Friday) and weekends (Saturday

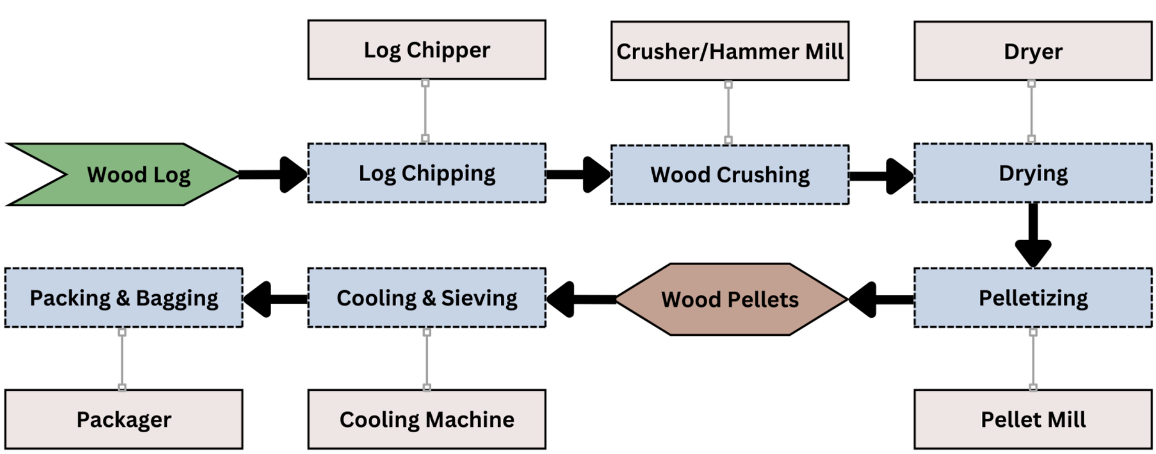

Fig. 1. Wood pellet production process (GemcoEnergy).

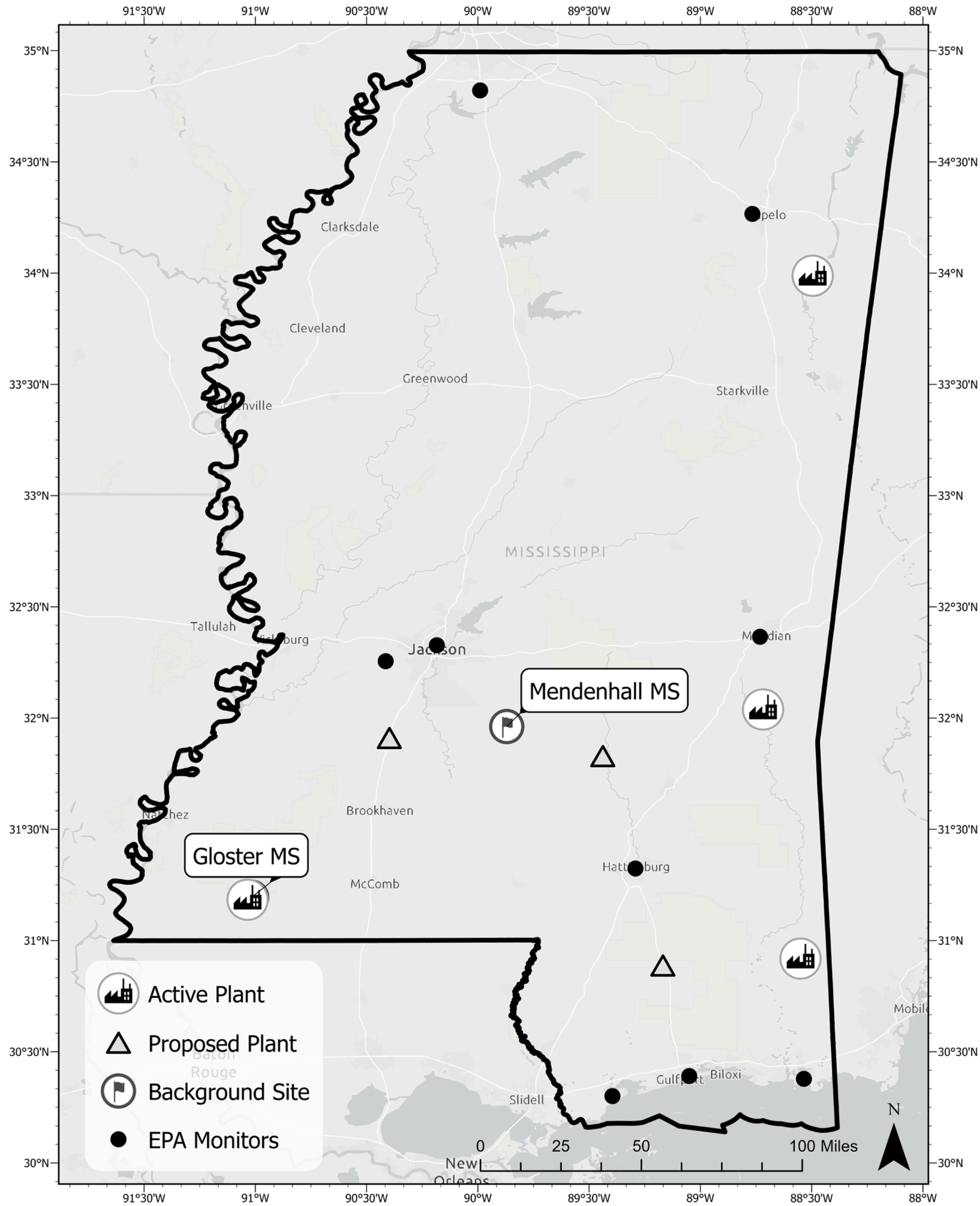

Fig. 2. Map of active and proposed wood pellet plants in Mississippi.

and Sunday). An equal number of sites were monitored during each time period to maintain consistency. A sound monitoring campaign was conducted in two sessions in November of 2021 in Gloster and between December 2023 and April 2024 in both Gloster and Mendenhall.

2.2. Sound level collection

Each sampling location was visited once, and short-term (five-minutes) measurements were collected at each location. Monitoring sites are shown in Fig. 3.

Sound data were collected using a Cirrus Optimus Green Octave Band Analyzer CR-171b (North Yorkshire, UK), at each of the center frequencies of 1:3 octave bands. The microphone of the CR-171Cb was mounted on a camera tripod such that the microphone was at a height of 1.5 m and oriented perpendicular to the nearest road. The CR-171b was calibrated before and immediately after each monitoring session. Calibrations were performed at 93.7 dB(A) at a frequency of 1 kHz using a Cirrus Optimus acoustic calibrator CR-515 (North Yorkshire, UK). The geographical location (latitude and longitude) of each sound level collection site was captured by geocoding and using the associated latitude and longitude coordinates from "pin drops" via a cell-phone Google Maps application. Additional onsite data collection consisted

Fig. 3. Distribution of noise monitoring sites in Gloster (A) and Mendenhall (B) Mississippi.

of capturing meteorological conditions (temperature, wind speed, relative humidity, dew point temperature) using The Weather Channel App (The Weather Channel. Atlanta, GA). Counts of road traffic and aircraft traffic and sound emanating from episodic events, such as barking dogs or ambulance sirens, were also collected in real time.

The following sound level metrics were measured and/or calculated to describe the environmental soundscape:

- A-weighted sound levels (dBA): This is the most typically reported sound weighting system. It emphasizes sounds processed through the auditory system and severely penalizes both low and high frequency sounds. (ISO 2016)
- C-weighted sound levels (dBC): This weighting system penalizes low and high frequency sounds less severely and is therefore a better metric when dealing with sounds that have high contributions from low and high frequency sound such as is the case in Gloster. (Murphy and King, 2014)
- Z-weighted sound levels (dBZ): This is unweighted sound and has a flat frequency response of 10 Hz to 20 kHz $\pm$1.5 dB. (IEC 2003)
- Infrasound (dB): Measures the sound levels $<$ 20 Hz. (ISO 2016)
- Center frequencies for the 1:3 octave band: 16 Hz, 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 8000 Hz, 16,000 Hz.

2.3. Statistical analysis

For each metric, descriptive statistics (arithmetic mean, standard deviation, min, q1, q2, q3, max) were calculated by time of day and day of week. T-tests were used to determine statistically significant differences in sound levels between cities. An alpha level of 0.05 was used to determine statistical significance. Spatial analysis was conducted primarily to visually interpret the estimated noise disparities evident in the data. The Kriging technique, the most prevalent method for geostatistical interpolation of noise distributions (Tsai et al., 2009; Rana et al., 2015; Zuo et al., 2016; Aumond et al., 2018), was used to generate prediction surface maps based on the A-weighted averages from each site across different time frames. The Kriging method interpolates by linearly combining values ($Z(x_\alpha)$) from n irregularly spaced measurement sites, using weights (w_α) to predict noise levels ($Z(x_0)$) at unmeasured locations. (Wackernagel, 1997) The weights are calculated based on the distance to neighboring sites and the spatial configuration of all measurement sites.

$$Z(x_0) = \sum_{\alpha=1}^{n} w_\alpha Z(x_\alpha)$$

All mapping analysis was performed in ArcGIS Pro. All statistical analysis was performed in R 4.2.1, RStudio 2024.04.0 + 735.

3. Results

3.1. Comparison of sound levels between wood pellet and background communities

Table 1 details the overall arithmetic mean, standard deviation, quartile, min, and max sound levels in both Gloster and Mendenhall, for A-weighted sound, C-weighted sound, unweighted sound, and infrasound. On average across all sound metrics, sound levels in Gloster are 2 - 6 dB higher than in Mendenhall (54 dBA vs 49 dBA; 66 vs 61 dBC; 70 vs 67 dB; and 65 vs 63 dB for A-weighted, C-weighted, Z-weighted, and infrasound levels, respectively). With the exception of infrasound, these differences are statistically significant. Fig. 4 visually demonstrates these disparities between the towns.

3.2. Variation in sound levels by time of day and day of week in Gloster and Mendenhall

A similar pattern emerges when considering sound levels by time of day and day of week. Table 2 provides the arithmetic mean and standard deviation for sound levels in both Gloster and Mendenhall, by time of day. Overall, within each town, daytime sound levels were higher than nighttime sound levels. Comparing daytime sound levels in Gloster to those in Mendenhall, there was there was a 1 - 6 decibel level difference in sound levels (55 dBA vs 49 dBA; 66 vs 61 dBC; 70 vs 72 dB; and 68 vs 67 dB for A-weighted, C-weighted, Z-weighted, and Infrasound levels, respectively). For nighttime sound levels, sound levels in Gloster remain higher than those in Mendenhall (51 dBA vs 48 dBA; 63 vs 59 dBC; 66 vs 64 db; and 58 for both Gloster and Mendenhalll for A-weighted, C-weighted, Z-weighted, and Infrasound levels, respectively).

Table 3 details weekday and weekend sound levels within and between the two cities. In Gloster and on average, sound levels tended to be similar between weekdays and weekends, while in Mendenhall, there were slight differences. Comparing between towns, on average, weekday sound levels in Gloster were higher than weekday sound levels in Mendenhall (54 dBA vs 48 dBA; 66 vs 61 dBC; 71 vs 68 dB; and 66 vs 65 dB for A-weighted, C-weighted, Z-weighted, and Infrasound levels, respectively). A similar pattern was observed for weekend comparisons (54 dBA vs 51 dBA; 65 vs 60 dBC; 67 vs 64 dB for A-weighted, C-weighted, Z-weighted sound respectively). However, in Mendenhall,

Table 1
Summary comparisons between Gloster and Mendenhall.

	Gloster	Mendenhall	P-value
A-Weighted (dBA)	54.17 (6.91)	48.57 (7.65)	2.22E-05
C-Weighted (dBC)	65.50 (6.28)	61.11 (6.52)	1.17E-04
Z-Weighted (dB)	70.41 (6.37)	67.49 (7.67)	0.020
Infrasound (dB)	64.92 (7.70)	63.12 (9.24)	0.23

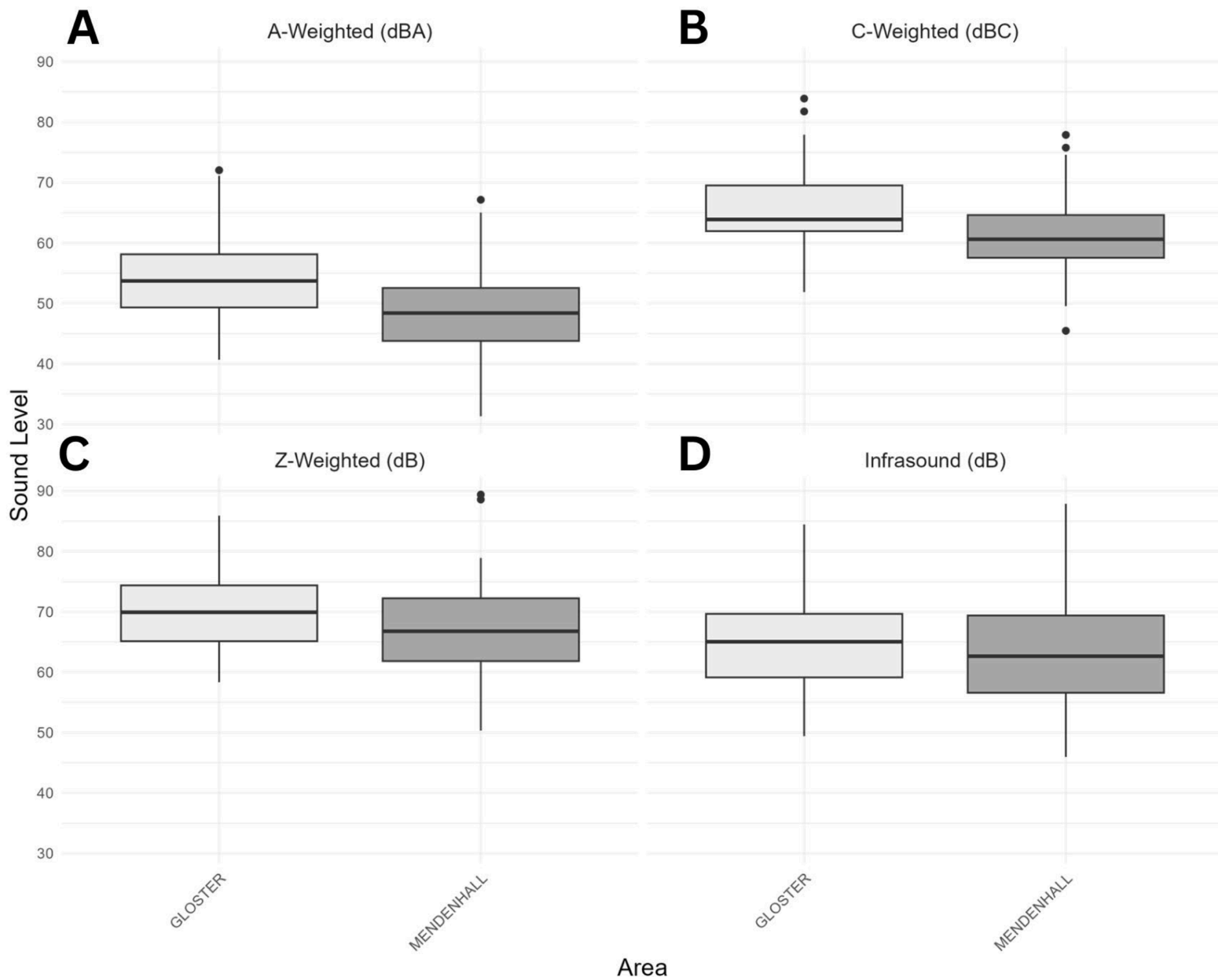

Fig. 4. Overall sound differences between Gloster and Mendenhall (A: A-Weighted (dBA), B: C-Weighted (dBC), C: Z-Weighted (dB), D: Infrasound (dB)).

Table 2
Sound metrics by time of day in Gloster and Mendenhall.

	Gloster		Mendenhall	
Time of Day	Day	Night	Day	Night
A-Weighted (dBA)	55.25 (7.40)	51.48 (4.55)	48.95 (7.05)	48.13 (8.43)
C-Weighted (dBC)	66.36 (6.89)	63.31 (3.66)	62.54 (6.08)	59.46 (6.75)
Z-Weighted (dB)	72.17 (6.45)	65.98 (3.29)	70.30 (7.45)	64.23 (6.67)
Infrasound (dB)	67.56 (7.15)	58.29 (4.34)	67.46 (8.42)	58.09 (7.52)

Table 3
Sound metrics by day of week in Gloster and Mendenhall.

	Gloster		Mendenhall	
Time of Day	Weekday	Weekend	Weekday	Weekend
A-Weighted (dBA)	**54.22 (7.26)**	**53.88 (3.77)**	**47.96 (7.59)**	**50.98 (7.76)**
C-Weighted (dBC)	65.58 (6.60)	64.91 (3.45)	61.32 (7.01)	60.29 (4.25)
Z-Weighted (dB)	70.92 (6.55)	66.87 (3.34)	68.35 (7.95)	64.13 (5.55)
Infrasound (dB)	66.04 (7.43)	57.22 (4.63)	64.53 (9.00)	57.61 (8.38)

weekend infrasound levels were higher 57 vs 58 dB (but not statistically significant).

3.3. Comparison of 1:3 octave band center frequencies between Gloster and Mendenhall

Fig. 5 details the 1:3 octave band center frequencies for both Gloster and Mendenhall, overall and by time of day. Overall (without considering time of day), across all center frequencies, there were higher decibel levels in Gloster as compared to Mendenhall. Statistically significant higher decibel levels were observed for the following center frequencies 125 Hz, 250 Hz, 500 Hz, 2000 Hz, 4000 Hz, and 8000 Hz. During the daytime, a similar pattern was observed. At night, with the exception for the decibel levels at 16 Hz, all center frequency decibel levels were higher in Gloster. However, only 250 Hz, 500 Hz, 2000 Hz, 4000 Hz, and 8000 Hz were statistically significantly higher.

3.4. Visualizing sound sources and noise propagation in Gloster and Mendenhall using Kriging maps

Fig. 6 contains a series of ordinary Kriging method prediction surface maps for A-weighted sound to visually demonstrate the sources, concentration, and spread of noise in both Gloster and Mendenhall. These maps highlight the general propagation of community sound levels and specifically illustrate the areas most affected by wood biomass industry

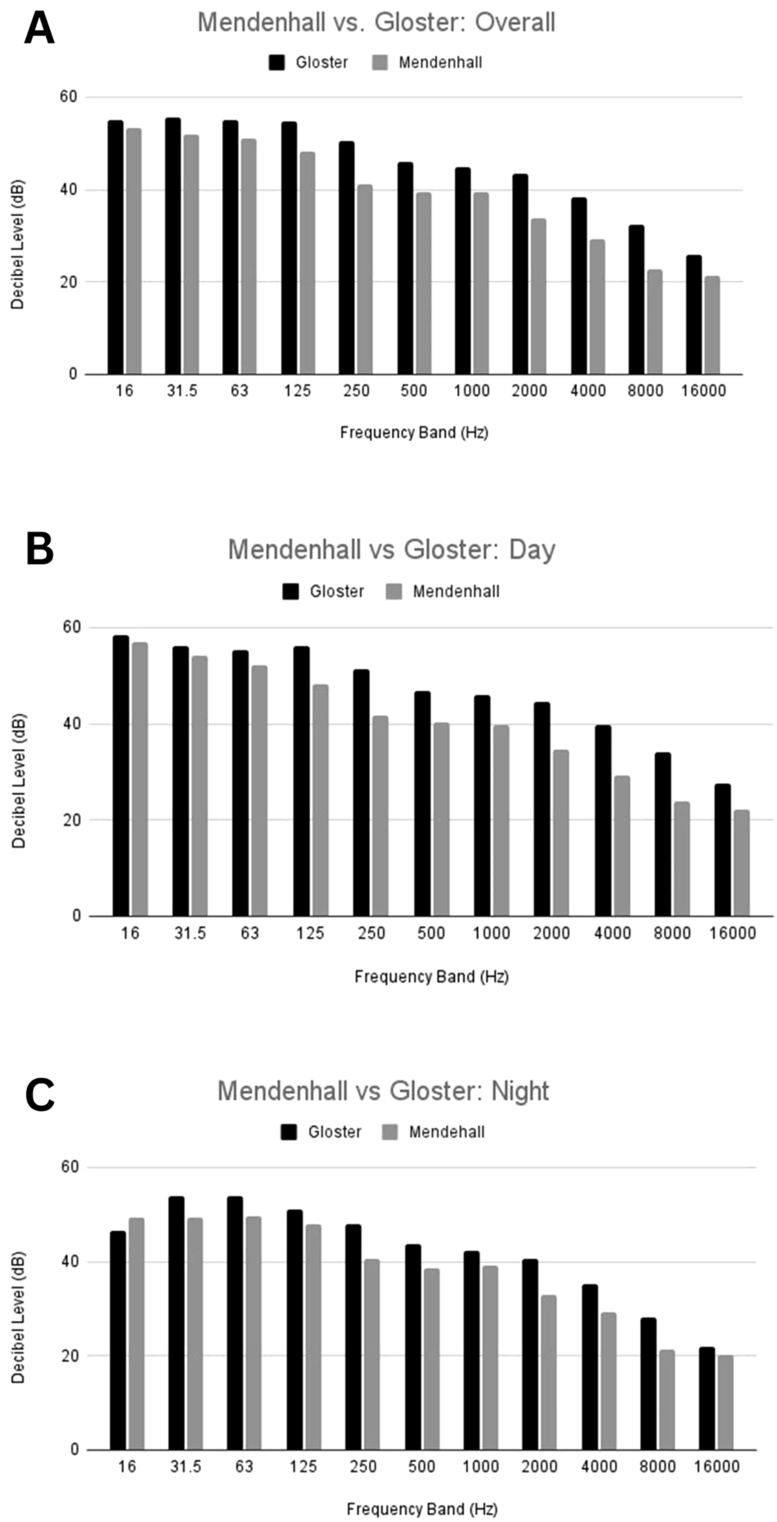

Fig. 5. Octave band analysis of sound levels Mendenhall and Gloster, MS. (A: Overall comparison, B: Daytime comparison, C: Nighttime comparison).

noise, showing how sound levels vary in intensity and distribution throughout each town.

4. Discussion

This study aimed to identify the major sound sources in a wood pellet manufacturing community, understand the dispersion of sound from the wood pellet plant, and determine which sound level metrics are most affected by this industry. Another goal was to examine how these factors influence the local soundscape, including variations by time of day and the extent of noise propagation into the community, and to compare these findings to a background community without industrial influence. By doing so, this study aims to highlight the need for comprehensive, localized environmental monitoring programs and emphasize the importance of integrating community voices into environmental justice research which has been proven to result in more valuable change.

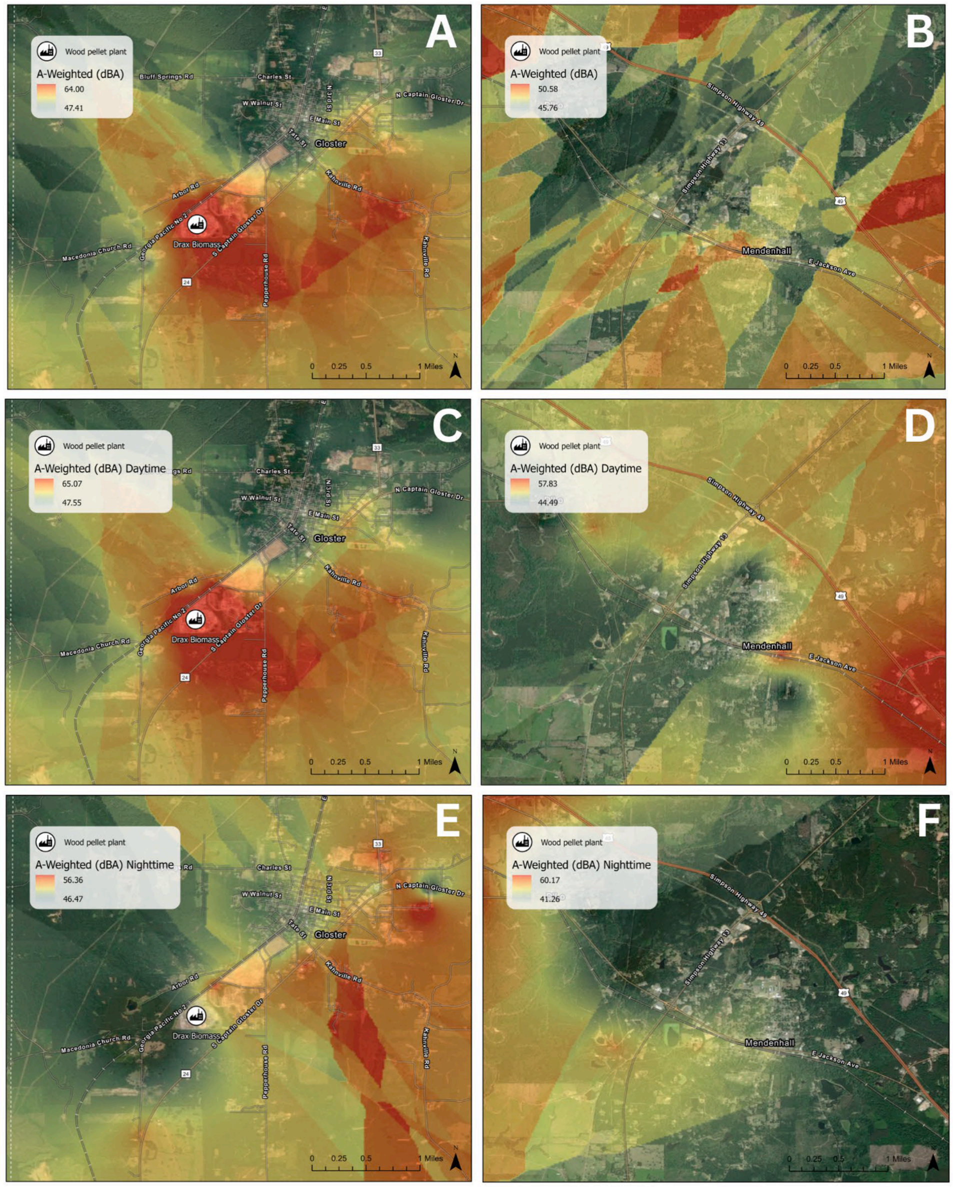

Fig. 6. A-Weighted kriging interpolation maps overall (Gloster: A, Mendenhall: B), daytime (Gloster: C, Mendenhall: D), nighttime (Gloster: E, Mendenhall: F).

(Davis and Ramírez-Andreotta, 2021)

Sound levels were measured in two rural Mississippi communities: Gloster, impacted by local wood biomass manufacturing, and Mendenhall, which served as a background community. There were statistically significant higher levels of A-weighted, C-weighted, and Z-weighted sound in Gloster compared to Mendenhall. These differences persisted across different times of the day and days of the week. Further, when looking at the decibel levels for each of the center frequencies of the 1:3 octave band, with the exception of nighttime levels in Mendenhall, these decibel levels were also higher in Gloster than in Mendenhall. Statistically significant differences were observed for decibel levels for 125 Hz, 250 Hz, 500 Hz, 2000 Hz, 4000 Hz, and 8000 Hz.

Our spatial maps of sound propagation in Gloster and the background community of Mendenhall visually demonstrated a few key points. First, in Gloster, sound levels from wood biomass manufacturing were highest near the manufacturing sites and propagated widely into the community, impacting households living within a radius of approximately 500–1000 m from the plant. Fenceline households—often low-income and disproportionately minority—were particularly affected.. (Virginia 2020; Fos et al., 2021) This aligns with existing literature showing that Black and Latinx populations are more likely to reside near industrial facilities, facing elevated health risks such as chronic conditions due to environmental exposures (e.g., noise and air pollution). (Virginia 2020; Fos et al., 2021; Whittemore, 2017; Southerland et al., 2023; Mohottige et al., 2023; Rossen and Pollack, 2012; Wilson et al., 2008)

Sound levels were also elevated on roads near the manufacturing area, where heavy truck traffic contributed significantly to the noise. During periods of intense truck activity, sound levels in these rural areas were comparable to urban traffic noise levels. In Gloster, the lowest sound levels were 41 dBA. In contrast, Mendenhall's soundscape, characterized by minimal industrial activity, recorded much lower levels, often as low as 30 dBA, highlighting the relatively quiet nature of rural settings unaffected by wood pellet production.

Our findings highlight the impact of exploitative zoning in otherwise tranquil communities. Rural communities may be particularly sensitive to changes in noise levels, with even minor increases being perceptible and impactful. Unlike urban areas, where louder sounds are expected due to proximity to diverse transportation, commercial, and social networks, rural expectations for soundscapes differ significantly. This contrast underscores the disruptive impact of industrial noise in such settings.

4.1. Limitations of the study

While our research provides valuable insights, several limitations should be noted. Firstly, the analysis presented in this article is based on short-term spot measurements lasting five minutes each. To comprehensively understand the impact of wood pellet manufacturing on the local community soundscape, a long-term monitoring network is necessary. However, despite the lack of depth in relying on short-term measurements, it allowed us to have a lot of breadth in our monitoring area, covering 150 measurement locations. This enabled us to understand both the temporal and spatial soundscape.

Secondly, beyond our spatial mapping, a deeper understanding of sound propagation from wood pellet manufacturing within Gloster may require the development of more sophisticated sound propagation models. These models should incorporate key spatial, temporal, and meteorological factors. Thirdly, logistical constraints such as community availability, funding, and weather conditions limited our ability to measure sound levels every day of the week. Consequently, this study was unable to analyze daily variations in sound levels comprehensively, particularly missing data for Mondays. This limitation led us to compare only weekday versus weekend sound levels. This underscores the importance of implementing long-term monitoring that spans an entire week and includes sites at various distances from the manufacturing area, pending sufficient funding.

4.2. Strengths and contributions

Despite these limitations, our study addresses a significant gap in the literature by focusing on noise pollution from wood pellet manufacturing, an often overlooked aspect of community environmental quality. Residents in these areas are often exposed to excessive sound levels 24 h a day, seven days a week. These residents experience acute health and well-being impacts including the disturbance of the quality and quantity of their sleep and an overall decrease in their quality of life. (Alleyne and Arroyo, 2013) Chronically, these acute responses can set of a stress cascade, leading to a host of negative mental and physical health outcomes. (Babisch, 2011; Basner et al., 2014; Chang et al., 2009; Babisch et al., 2005; Dratva et al., 2012; Erickson and Newman, 2017; Halonen et al., 2015; Hansell et al., 2013; Héritier et al., 2017; Petri et al., 2021; Passchier-Vermeer and Passchier, 2000; Ma et al., 2018; Lee et al., 2022; Babisch et al., 2013; Ndrepepa and Twardella, 2011)

This study is among the few that examine the impact of wood pellet manufacturing in rural communities in Mississippi. A variety of community sound metrics were used that provide an alternative to the commonly reported A-weighted based metrics. Traditionally, most local, state, and federal policies addressing community noise issues focus on metrics using the A-weighted decibel (dBA). The A-weighting system emphasizes the frequency range where the human ear is most sensitive (2000 –5000 Hz), while discounting both higher and lower frequencies. (Alves-Pereira and Castelo Branco, 2007) Additionally, the human body can and does process sound outside of the auditory system—in particular lower frequency sound. Existing research demonstrates that on top of a sound's loudness, its frequency profile is also an important characteristic to consider, especially when assessing the relationship between community sound levels and health outcomes. (Waye et al., 2002; Walker et al., 2016; Chang et al., 2014)

In this article, not only are additional weighting systems that penalize both lower and higher frequencies less considered, infrasound and center frequencies across the 1:3 octave band are also used. This way, a more comprehensive understanding of the character of sound in communities that are impacted by wood biomass manufacturing is possible.

This may be of concern in Gloster, given that sound levels dominated by low frequencies, can travel long distances without much loss of energy and can penetrate more easily through barriers, making them much more difficult to abate (Berglund et al., 1996). In Gloster, these additional sound metrics are particularly important, especially given that the nearby wood biomass manufacturing utilizes equipment such as industrial dryers and pellet mills, as well as heavy trucks. In this setting, using only an A-weighted metric severely mischaracterizes the sound contributions from wood pellet manufacturing. This limitation is particularly concerning in fenceline communities.

5. Conclusion

Our findings demonstrate that noise pollution from wood pellet manufacturing significantly alters the soundscape of rural communities like Gloster, with consistently higher sound levels across multiple metrics, including A-weighted, C-weighted, Z-weighted, and infrasound, compared to the background community, Mendenhall. These differences are particularly pronounced during the day and on weekdays, with Gloster experiencing sound levels 2 to 6 dB higher than Mendenhall. The statistically significant elevation in sound levels, especially in the 125 Hz to 8000 Hz octave band frequencies, suggests that industrial activity in Gloster is contributing to persistent noise exposure, with potential implications for community health.

Addressing these disparities requires a comprehensive re-evaluation of how industrial plants are sited. Environmental regulations and zoning laws should be designed to protect vulnerable communities from the cumulative burden of industrial pollution. For example, stricter noise and pollution regulations, combined with more rigorous environmental impact assessments, could ensure that industrial developments are located in a way that minimizes harm to surrounding populations. Moreover, increased community engagement in the decision-making process is crucial to ensure that the voices of those most affected are heard and considered.

Looking ahead, it is crucial to situate our findings within the broader context of sustainable wood pellet production across the United States and globally. In the broader context of sustainability, our findings highlight the importance of developing and implementing practices within the wood pellet manufacturing industry that balance economic growth with environmental and public health concerns. As demand for renewable energy sources like biomass grows, it is critical to integrate environmental justice principles into the expansion of this sector, ensuring that rural and marginalized communities are not disproportionately burdened by noise or other environmental pollutants. This includes developing more sophisticated sound propagation models, examining the cumulative impacts of multiple pollutants, and advocating for policies that prioritize community health and equity.

With adequate funding, we plan to overcome our current research limitations and broaden our study to encompass the total environment—including air, sound, soil, and water pollution—and its effects on the health of adolescents living in communities impacted by wood pellet manufacturing throughout their lives. Additionally, there are other wood biomass manufacturing impacted communities in Mississippi and we would like to expand our research to these areas as well.

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CRediT authorship contribution statement

E.D. Walker: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **N. Franzen Lee:** Writing – review &

editing, Visualization, Validation, Formal analysis, Data curation. **C. Nica:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Formal analysis, Data curation. **A. Barnes:** Writing – review & editing, Methodology, Data curation. **B. Graham:** Writing – review & editing, Supervision. **K. Martin:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.envc.2024.101024.

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