Original Article

Environmental and Social Impact Analysis of Industry on the Surrounding Communities in Bojonegara District, Serang, Banten

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ABSTRACT

Background: Concrete industry activities in Bojonegara County, Attack, Banten have potential environmental pollution which impacts the quality of the environment and public health. Community awareness of environmental issues also plays an important role in efforts to mitigate these impacts. Objective: to identify the level of noise and air pollution occurring around the Industry in Bojonegara, as well as its impact on the environment and surrounding communities.
Method: This type of research is conducted with a descriptive approach that uses data collection techniques, including documentation, observations, and surveying. The indicator used is the New Ecological Paradigm (NEP) indicator. The NEP instrument consists of six indicators, namely rejection of anthropocentrism, awareness of vulnerable natural balances, the likelihood of ecological crises, rejection of exclusivity, growth limitations, and new community capabilities. Participants in this study included youth groups, RT chairs, and residents around the industry.
Result: Research shows that youth groups have a higher environmental awareness than RT Chairs and other citizens, particularly in terms of anthropocentrism and the use of technology in addressing environmental issues. Meanwhile, RT groups showed relatively lower scores, indicating the need for an increase in environmental literacy at the local institutional level.
Conclusion: The findings emphasize the importance of cross-generational, participatory, and transparent approaches in environmental policy making, including industrial development planning. It also stressed the importance of active coordination between industry and society to mitigate potential environmental damage through comprehensive environmental impact studies and all stakeholder engagement.

INTRODUCTION

In the macro context, industry encompasses "all sectors capable of creating added value and is generally divided into two categories: industries that produce goods and industries that provide services." Meanwhile, in the micro perspective, industry is understood as a group of companies capable of producing similar products or products that can closely substitute one another (Wibowo, Sutandi, Andy, & Hidayat, 2022). The industry located in the Bojonegara area is engaged in concrete manufacturing, with company performance continuing to grow rapidly alongside the increasing demand for concrete products.

Every industrial activity produces effects. One of the significant effects generated by the concrete industry is disturbing noise, which is caused by mechanical vibrations from the concrete

production process. According to Silviana *et al.* (2021), if the noise exceeds the specified limit, it can be categorized as noise pollution. According to Supiati & Sugandi (2022). Noise pollution refers to environmental disturbances caused by sounds or noises that create discomfort for living beings in the surrounding area Fajriyyah *et al.* (2023). Stated that the major threats or consequences of noise pollution include a decline in the quality of the human environment, as noise can damage environmental conditions. Based on the Decree of the Minister of Environment No. 48 of 1996, noise is defined as unwanted sound originating from activities or businesses, with certain intensity and duration, that can negatively impact human health and environmental comfort (Kementrian Lingkungan Hidup, 1996). This is in accordance with (Rusmayanti, Nurhasanah, & Zulfian, 2021), who stated that noise can lead to hearing loss and eventually result in deafness. Every living creature has a limit to its hearing ability, including animals. Human hearing is limited to frequencies between 20 Hz and 20 kHz. On the other hand, mice, which belong to the category of rodents, have a hearing range operating at frequencies of around 2 kHz to 50 kHz (Fikram, Lantara, & Alisyahbana, 2023).

Air pollution refers to the introduction of substances, energy, or other components into the air as a result of human activities, exceeding the established air quality standards (ambient air quality decreases to a level where it can no longer fulfill its function). Air pollution caused by dust particles has surpassed the quality standards set by the Government Regulation of the Republic of Indonesia No. 41 of 1999. PM2.5 and PM10 are particles composed of various compounds such as sulfates, nitrates, carbon, ammonium, hydrogen ions, organic compounds, and water-bound particles (Santika et al., 2023; Siregar et al., 2022). According to Government Regulation of the Republic of Indonesia No. 41 of 1999 concerning air pollution control, air pollution is defined as the infiltration or insertion of substances, energy, and/or other elements into the air as a result of human activities, causing a decrease in ambient air quality to a certain level that renders the ambient air unable to perform its roles and functions (Hasan, 2020). In addition, air pollution is a complex and widespread mixture of pollutants, including particulates, chemical substances, and biological materials (Mannucci, Harari, Martinelli, & Franchini, 2015). The decline in air quality makes the air no longer capable of performing its functions optimally for the environment and the health of living beings. Hazardous elements mixed in the atmosphere, such as pollutant particles and chemical gases, can cause environmental damage and pose risks to human health (Sudibya, Afaaf, Satria, Prasna, & Kamal, 2025).

One of the long-term consequences of air pollution is climate change, as many human activities release greenhouse gases that contribute to global warming. Air pollutants such as carbon dioxide (CO_2), methane (CH_4), and nitrogen dioxide (NO_2) not only degrade air quality but also exacerbate the climate crisis. Therefore, it is necessary to control air quality and pollution to maintain its function and ensure the sustainability of life (Winatama & Derystanto, 2023).

This study aims to identify the levels of noise and air pollution occurring around the industries in Bojonegara, as well as their impacts on the environment and surrounding communities.

METHODS

The research was conducted in the area surrounding the Concrete Industry, located on Jalan Raya Bojonegara – Salira, Kampung Solor-Lor No. 18/8 Margagiri, Bojonegara District, Serang Regency, Banten. The location was selected purposively because it is considered an area with potential direct impacts from industrial activities on the environment and the community.

This study employed a descriptive approach using data collection techniques that included documentation, observation, and questionnaires. The questionnaire used was the New Ecological Paradigm (NEP) scale. The NEP instrument consists of six indicators: rejection of anthropocentrism, awareness of the fragility of nature's balance, the possibility of ecological crises, rejection of human exceptionalism, limits to growth, and the capability of a new community. The NEP (New Ecological Paradigm) instrument used contains 15 test items, divided into 5 ecological items (viewing humans as part of nature) and 7 anthropocentric items (viewing humans as rulers of nature). Participants in this study included youth groups, neighborhood heads

(RT), and residents living around the industry. According to Utari (2019), NEP reflects attitudes toward nature concerning anti-anthropocentrism, the fragility of nature's balance, the potential for eco-crisis, anti-exemptionalism, limits to growth, the concept of a new society with planning, openness and participation, as well as the ability to solve environmental problems through science and technology (Utari, 2019).

RESULTS

Based on the research result using data colletion techniques that included documentation, observation, and the New Ecological Paradigm (NEP) questionnaire, a radar diagram was produced to visualize the comparison of environmental attitudes and perspectives among three community groups: youth, neighborhood heads (RT), and residents living around the industry, as follows:
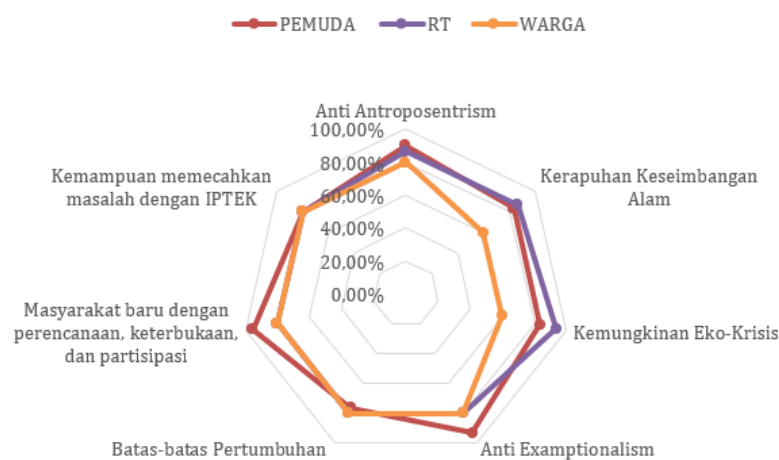

 Figure 1. Community NEP score radar diagram

Descriptive Statistics

The displayed diagram visualizes the comparison of environmental attitudes and perspectives, based on the New Environmental Paradigm (NEP) framework, among three community groups: youth, neighborhood heads (RT), and residents. The six NEP indicators include: anti-anthropocentrism, awareness of nature's fragility, the possibility of an ecological crisis, anti-exemptionalism, limits to growth, and the capacity of new communities focused on participation, openness, and the use of science and technology (IPTEK) in addressing environmental issues.

The NEP measurements show that the younger generation (youth) consistently obtained the highest scores across almost all measured indicators, reflecting a higher level of ecological awareness compared to the RT and resident groups. In the anti-anthropocentrism indicator, youth demonstrated a critical stance toward human domination over nature, aligning with, who stated that anthropocentrism places humans at the center of the world and leads to environmental degradation if left unchecked. Research by Syam *et al.* (2024) also emphasizes that young people are capable of building communities that are sensitive to environmental issues and promote sustainability. This phenomenon aligns with the findings of (Wulandari et al., 2024), which indicates that community elements are not limited to adults or the elderly children and adolescents also play an essential role in understanding and applying values related to environmental awareness. Knowledge of environmental care values can influence behaviors that reflect a person's character and attitude toward their surrounding environment.

In terms of the indicators of the fragility of nature's balance and the potential for an ecological crisis, (Makinggung, Siwu, & Tuela, 2021), explain that examples of ecological crises include environmental damage caused by plastic waste, excessive exploitation of natural

resources, illegal logging, vehicle emissions that lead to air pollution, and other ongoing issues. Although environmental issues have been intensely discussed and advocated for over the past five decades, the ecological crisis continues. Human activities, whether direct or indirect, as well as natural processes, have caused a decline in air quality to levels where the environment is no longer able to function effectively (Indrayani & Asfiati, 2018). Regarding the fragility of ecological balance, (Utari & Mahrawi, 2019) state that ecosystem imbalances are primarily caused by human actions. Natural phenomena can also trigger ecological imbalance, especially during natural disasters such as volcanic eruptions, floods, and tsunamis. These two factors appear to have heightened awareness among students about the importance of protecting nature from various threats to its balance. All three groups demonstrated relatively similar levels of awareness, with a slight advantage among the youth group. This result indicates that despite demographic differences, awareness of the negative impacts of However, the higher perception of potential ecological crises among youth (80%) and residents (40%) compared to neighborhood heads (RT) (80%) shows differences in perspectives between generations and institutions regarding future environmental risks. This divergence may be influenced by the short-term economic orientation that remains a priority for RT groups in supporting local industrial growth. In contrast, youth, with a more visionary outlook, believe that ecological vulnerability should be an integral part of development policies, considering that the global climate crisis has already shown real impacts across various sectors (Ulfa, 2022).

The belief that humans have special rights to exploit nature without limits is beginning to fade, which is a positive sign that ecological values are being increasingly accepted among various groups. Anti-exemptionalism is part of the New Ecological Paradigm (NEP) that specifically highlights individuals' beliefs in rejecting human superiority over nature. This perspective reflects an acknowledgment that humans are an integral part of the broader ecosystem and cannot be separated from natural limitations (Suharko, 2024). However, when discussing limits to growth, the scores obtained by the three groups were still relatively low, particularly among neighborhood heads (RT) (80%). This indicates that the concept of sustainable development and the limitations of natural resources are still not well understood by most respondents, especially local stakeholders. According to Tiawati *et al.* (2023), anti-exemptionalism is a component of the NEP that examines an individual's rejection of the idea that humans are exceptional beings. This is reflected in three statements emphasizing that human uniqueness does not exempt them from environmental responsibility. This condition shows that although there is normative recognition of nature's limitations, the practical application of the precautionary principle in economic activities still requires strengthening at the local policy level (Fajri, Pratama, & Kharisudin, 2023).

In the limits to growth indicator, it was observed that all three groups still showed relatively low levels of awareness, particularly the neighborhood head (RT) group, which obtained the lowest score. According to (Fajri et al., 2023), this proves that short-term approaches in several regions have begun to affect the efficiency of "green" development, where the emphasis on physical results and economic growth sometimes sidelines environmental considerations. Studies show that economic development and population growth in Indonesia have negatively affected environmental quality indicators. Therefore, if growth limits are not recognized or properly managed, environmental quality will continue to decline (Ulfa, 2022). On the other hand, although the youth group's score was not yet optimal, they showed a better tendency to understand the importance of maintaining a balance between development and environmental capacity. Understanding ecological concepts and processes, as well as the ability to apply them in daily life, is key to fostering environmentally conscious behavior among the younger generation (Wulandari *et al.*, 2024).

According to (Utari & Mahrawi, 2019), in order to develop plans for environmental (natural resource) management, it is essential to involve individuals who truly understand the methods, reasons, and actions needed to protect nature. Such planning is crucial, as it represents a systematic, coordinated, and synergistic effort aimed at creating a society that is aware of and cares about natural resources. Furthermore, based on the new community indicator, which includes openness to innovation, participation in planning, and the use of technology to address environmental issues, the youth group once again demonstrated superiority. They showed a

higher level of understanding of the importance of integrating science and technology (IPTEK) in tackling ecological problems. In this regard, (Utari & Mahrawi, 2019), emphasize that the educational process plays a key role in providing information and shaping individuals' perspectives on how to plan, implement, and utilize natural resources wisely. This is supported by (Desfriyati & Dinnie, 2022), who note that the millennial generation today is expected to be proactive and capable of acting wisely, especially in the use of technology—showing that millennials are more adept at using social media and various technologies. This is also reinforced by the findings of Widhi *et al.* (2025), nditions with greater accuracy compared to conventional techniques, as AI can process large volumes of data in real time. Moreover**,** the younger generation represents the future leaders and decision makers of Indonesia**,** and their active participation in analyzing and solving environmental issues can have a significant impact on the country's long-term sustainability (Rachman, Matsumoto, & Yustiani, 2024).

Study Limitations

This study has several limitations: (1) The descriptive research design only provides a snapshot of environmental and social impacts at a single point in time, making it unable to determine causal relationships between industrial activities and community environmental awareness. (2) The research area, which focused only on one industrial zone in Bojonegara District, limits the generalizability of the findings to other regions with different industrial and socioeconomic characteristics. (3) The purposive selection of participants including youth groups, neighborhood heads (RT), and local residents may introduce representation bias. (4) Data collection through questionnaires and observations may contain subjectivity or response bias from participants and (5) The study did not directly measure specific pollutant levels (such as PM2.5, PM10, or noise decibels) using technical instruments, which could have strengthened the environmental impact analysis.

Future studies are recommended to employ a mixed method or longitudinal design that integrates quantitative environmental measurements and qualitative community perception analysis to better understand the dynamic relationship between industrial activities, environmental degradation, and social awareness over time.

CONCLUSION

From the overall results, it can be concluded that the youth group demonstrates the strongest tendency toward NEP values, making them a strategic potential in promoting sustainable development at the community level. Conversely, the relatively lower scores among the neighborhood head (RT) group indicate the need for initiatives to improve environmental capacity and literacy at the local institutional level, given their crucial role in decision-making and environmental regulation within their communities. This perception gap also underscores the importance of cross-generational and participatory approaches in formulating environmental policies that are fair, inclusive, and effective. Factories should actively coordinate with local residents before commencing development**,** through open dialogue and public consultations. It is important to involve all age groups, including youth and RT representatives, to understand the concerns and aspirations of the community. In addition, factories need to conduct environmental impact assessments transparently and develop mitigation plans to prevent environmental degradation, ensuring that development proceeds sustainably while gaining strong social support.

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