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MORALITY BEFORE KNOWLEDGE

From awareness to action: Understanding urban community participation in tree planting initiatives

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ABSTRACT

Background: Tree planting activities in urban areas are an important strategy to enhance the environmental quality for the communities living in those regions. Tree planting offers numerous benefits that can be experienced in daily life, which is why it is essential to raise awareness, particularly among urban communities, to engage in tree planting around their residential area. In addition to the benefits gained from tree planting, there are also potential drawbacks that can arise from planting trees in urban areas. This article aims to examine the awareness behaviour of tree planting and the barriers faced by urban communities in this regard. **Methods**: Through a literature review and a study of the perceptions of the community in Tangerang City, this research identifies the factors influencing individual decisions to engage in tree planting and measures the positive impacts generated by such initiatives. **Findings:** The primary motivations of residents for tree planting are to improve air quality, reduce temperatures, and simultaneously enhance the beauty and aesthetics of the surrounding environment. Additionally, participation in urban tree planting is often influenced by environmental awareness, community support, and government policies. Some of the benefits of tree planting include improved air quality, CO_2 emission absorption from human activities, and the enhancement of green spaces that positively impact public health. **Conclusion**: This study concludes that increasing awareness of the benefits of tree planting, along with support from the government and communities, can encourage broader participation in these activities. **Novelty/Originality of this article:** Policy recommendations include promoting tree planting programs, providing incentives for participants, and strengthening cooperation among stakeholders, all of which are expected to achieve more optimal outcomes in urban environmental management.

KEYWORDS: community awareness; tree planting; urban community perception.

1. Introduction

Tree planting as a greening activity aims to introduce, conserve, and maintain outdoor vegetation in urban areas, contributing significantly to the overall environmental health and well-being of urban ecosystems (Eisenman et al., 2020). Biodiversity, which encompasses the wide variety of species, genes, and ecosystems on Earth, forms the fundamental foundation for ecological balance, resilience, and long-term sustainability of the environment. According to G. Tyler Miller, a renowned environmental expert, biodiversity plays a critical role in maintaining the stability of ecosystems and in providing a wide range of vital services that directly support human life, including air purification, climate regulation, and the provision of food and natural resources. Greening strategies in urban areas are currently being implemented in cities around the world, with several clear benefits, such as the provision of essential ecosystem services that benefit communities,

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improve urban livability, and enhance overall public health (Drew-Smythe et al., 2023). Additionally, tree planting provides opportunities to establish "street gardens," which serve not only as aesthetic enhancements but also contribute to sustainability, foster a sense of belonging, and strengthen social bonds within the local communities (Fadaee, 2019). In addition to environmental benefits, tree planting in urban areas has significant positive impacts on air quality, public health, and community well-being. Research evaluating the reduction of asthma rates due to improved air quality from urban trees must take into account a series of interconnected bio-physical processes, such as the absorption of pollutants, the release of oxygen, and the overall cooling effects of trees (Eisenman et al., 2020). Urban forest refers to tree systems located in cities, suburbs, villages, and other urbanized areas, including both public and private lands. It encompasses trees planted along streets, in residential yards, well-designed parks, and natural areas, contributing to the aesthetic and ecological value of urban spaces (Miller, 2018). Urban forestry, as a field, involves the management and study of trees and forest resources in urban environments, with the goal of maximizing environmental, social, and economic benefits for city dwellers. Several definitions of urban forestry explicitly mention its goals, such as providing environmental benefits like improved air quality and reduced urban heat, social benefits such as recreation and aesthetic value, and economic benefits like increased property values and tourism. Urban forestry practices are intrinsically linked to urban greening initiatives, but urban forestry itself has distinct disciplinary traditions and professional fields that set it apart as an essential element of sustainable urban planning (Konijnendijk et al., 2006).

According to Kirsten M. Paris, in her book Ecology of Urban Environment, urban greening policies need to be enhanced and strengthened, especially in urban areas that face rapid urbanization but lack sufficient green open spaces. Several previous studies have shown that green spaces can correlate with improvements in the mental and physical health of residents living in those areas. Tree planting in urban areas not only supports the creation of biodiversity in flora and fauna but also proves to enhance the quality of life for residents, particularly in addressing climate change due to rising temperatures. Through innovative greening programs, such as tree planting along streets, the development of vertical gardens, utilization of rooftops of houses or buildings, and the use of land around residential areas, not only can beauty be improved, but it also helps in carbon absorption, thus reducing the impact of the urban heat island effect, one of the main causes of which is the lack of tree planting in urban areas due to limited land availability, as most of it is occupied by buildings and housing. According to Sari (2021) in Ufaira et al. (2023), vegetation also provides shade under the trees, physically protecting people from heat, making it more comfortable to carry out activities under the tree canopy. Green open spaces play a vital role in creating sustainable cities as they function as carbon absorbers, maintain biodiversity, serve as aquifers, and help in controlling air pollution (Indira et al., 2021). Green open spaces are provided for public use, supporting social interaction, recreation, and connections with nature (Sutapa et al., 2023).

Tree planting in urban residential areas, along with the creation of urban forests, is essential as it serves as the city's lungs, generating oxygen for the benefit and health of the surrounding residents. In addition, tree planting and the development of urban forests can beautify the city, making the minds and emotions of the community feel fresher, which can ultimately increase work productivity (Gafur et al., 2017).

According to (Wai et al. 2018 in Sarofah et al. 2023), green open spaces are part of spatial management and utilization, supported by its management. Green open spaces also play a role in preventing pollution and environmental degradation. Based on the law, the target for green open spaces is 30% of the total area, and achieving this target requires good cooperation from various parties, not only the government but also other stakeholders, which is divided into several functions. Ecological function: Green open spaces serve several purposes, including improving water quality, reducing the risk of flooding, and playing a role in regulating the microclimate. Social and cultural function: Green open spaces create opportunities for social interaction. In addition, the community can use these spaces for recreation and as landmarks for specific locations. Green open spaces also have

architectural/aesthetic value that provides comfort, such as parks and green corridors. Economic function: Green open spaces can attract more people and visitors to a location. Furthermore, green open spaces can be used to manage the city's green tourism facilities, which have the potential to boost the local economy. The presence of green open spaces leads to the conclusion that these areas provide comfort, freshness, and beauty to the environment, making it clean and healthy for city residents. Green open spaces can also produce various types of wood, flowers, leaves, and fruits.

Previous studies have shown that trees can absorb CO_2 from the air, as the absorption of CO_2 is a physiological process in plants known as photosynthesis. This process is influenced by several environmental factors, especially solar radiation and the concentration of CO_2 in the atmosphere (Hidayati et al., 2020). The amount of CO_2 absorbed by trees varies depending on variables such as stomatal conductance and the chlorophyll content in their leaves (Hidayati et al., 2020). A study conducted in an industry located in the Tangerang area showed that the tree planting carried out had significant potential in terms of biomass, carbon content, and the ability to absorb CO_2 emissions, which contribute to the high levels of greenhouse gas emissions which can assist in mitigating climate change. Additionally, it is crucial to plant local species of plants or trees in green open spaces to ensure that these plants can continue to reproduce and adapt to environmental changes in the future (Heriyanto et al., 2023).

In addition to the benefits that urban communities can experience from tree planting, there are also potential disadvantage, such as those related to the following aspects: (1) infrastructure, (2) culture, aesthetics, and social factors, (3) environmental and energy issues, and (4) management costs (Roman et al., 2021). In terms of disadvantage, an example can be seen in how trees growing in urban areas can damage surrounding infrastructure, such as the deterioration of sidewalks due to tree roots, the obstruction of traffic signs by trees that grow taller than the signs, and the potential for trees to fall, causing damage to nearby buildings or even harming people (Roman et al., 2021). Regarding cultural, aesthetic, and social issues, one example is the aesthetic impact of poorly maintained branches, twigs, and leaves of trees (Roman et al., 2021). Although tree planting in urban areas has its benefits, there is also an increased energy demand for maintaining these trees. For instance, both the government and the community must allocate more water for irrigation, which can become problematic in cities experiencing drought, as it exacerbates water shortages that are already affecting daily life (Roman et al., 2021). Additionally, tree management costs are another challenge. The government or the community must incur extra costs to maintain the trees, such as purchasing fertilizers and pruning the trees when necessary (Roman et al., 2021).

According to the theory (Green, 1980) in the educational book (Notoatmodjo, 2012), there are three main factors that can influence an individual's behaviour, namely predispositional factors, enabling factors, and reinforcing factors. Predispositional factors include the level of knowledge and beliefs about a particular community environment. Enabling factors refer to those influenced by the availability of infrastructure, facilities, and other resources in the community. Reinforcing factors involve the behavior of the government, local leaders, or community figures, who are expected to serve as role models for good behavior within the community.

According to the website of Tangerang City, as of 2023, the city has 230 green open spaces spread across all subdistricts in the Tangerang City area. According to the Head of the Culture and Tourism Department of the Tangerang City Government, these green open spaces serve as actions to reduce the impact of air pollution, act as water catchment areas, and contribute to creating a green and pollution-free environment. This is in line with Law No. 26 of 2007 of the Republic of Indonesia on spatial planning, which mandates that every city must allocate 30% of its land for green open spaces.

Several studies conducted in various locations, as mentioned in several scientific articles, reveal that although significant benefits are obtained from tree planting in urban areas, further in-depth studies are needed regarding its long-term effectiveness and the potential impacts on the surrounding area and environment, which may include issues and

potential drawbacks resulting from tree planting. Therefore, this article aims to compare these theories with a simple study conducted with respondents living in urban areas, linking it with the level of awareness regarding tree planting. So far, the public is considered not to fully understand climate change, even though they are aware of its impacts. The communities most affected by climate change are those whose livelihoods depend on the natural environment, such as farmers. On the other hand, some people understand that the climate change occurring over the past few decades is caused by human activities. The level of public perception and knowledge will influence how they respond to the negative impacts of climate change (Nurhayati et al., 2018). This study contributes to research on urban community perceptions in tree planting within the city, with a focus on Tangerang City. Although previous studies have shown the benefits of trees in improving air quality, biodiversity, and climate change mitigation, there is a lack of in-depth research on the barriers and potential drawbacks faced, such as limited land, maintenance costs, and infrastructure damage. This study fills that gap by using a quantitative approach through questionnaires with 101 respondents, to evaluate the influence of predisposition, enabling, and reinforcing factors on public behavior in tree planting. The results are expected to provide new insights for formulating more effective public policies to support greening programs in urban areas.

2. Methods

In this article, the research method employed is the quantitative research method. This approach focuses on processing numerical data to evaluate the variables involved in testing the formulated hypotheses. In this quantitative method, data is obtained through measurement processes by distributing questionnaires to several respondents who meet the research criteria (Sugiyono, 2018). In this article, the primary respondents are individuals residing in urban areas across various regions of Tangerang City. The respondent population sampled in this study consists of 101 individuals, selected through purposive sampling to ensure that participants have relevant experience and knowledge regarding the topic of tree planting in urban environments. Data collection for this research was conducted through the distribution of questionnaires aimed at understanding and analyzing the perceptions and awareness of urban residents regarding the benefits and challenges associated with tree planting in their residential environments, particularly in terms of environmental, social, and economic impacts (Danquah et al., 2023). The insights gathered from this study will contribute to a deeper understanding of community perspectives on urban greening initiatives and help in shaping future policies related to tree planting and sustainable urban development.

This study examines two variables: dependent and independent variables. The dependent variable refers to the variable being influenced, which in this research is the perception and awareness of the community regarding the importance of tree planting in urban areas. This perception encompasses factors such as environmental sustainability, aesthetics, and the impact on overall quality of life. On the other hand, the independent variable is the influencing factor, which in this study includes variables related to government policies and support, land availability, and the perceived benefits and challenges of tree planting (Ibrahim et al., 2022). These influencing factors are key to understanding how external conditions and individual experiences shape the community's attitudes towards urban tree planting initiatives. The interplay between these variables will be analyzed to explore how they contribute to fostering or hindering positive perceptions and awareness of tree planting in urban environments.

The predisposing factors in this study represent the level of trust and awareness among urban communities, as well as their active participation in recognizing the benefits of tree planting. These benefits include improving air quality in their area and other advantages such as flood prevention through water absorption, reducing urban heat islands, and the utilization of fruits and leaves as food resources. These factors also extend to the potential for increased biodiversity, promoting a healthier ecosystem, and enhancing the aesthetic

value of urban spaces. The enabling factors in this research were analyzed based on the availability of infrastructure and facilities for tree planting, particularly land availability, which serves as a critical resource for establishing green spaces. The physical infrastructure such as public parks, roadsides, and vacant lots also plays a significant role in enabling successful tree planting initiatives. The reinforcing factors were derived from community perceptions of support from local governments, including policies to promote tree planting programs, incentives to encourage active community involvement, and the need for education and socialization efforts. These efforts aim to enhance public knowledge and awareness of the importance of tree planting in urban areas, ensuring long-term sustainability by fostering a collective commitment to greening efforts. Several factors influence urban community participation in tree planting. According to a study conducted by (Roman et al. 2021), while tree planting in urban areas provides numerous benefits, there are also significant barriers faced by urban residents, which can lead to potential disadvantages associated with tree planting.

3. Results and Discussion

The results of the study, obtained through the distribution of questionnaires to several urban residents, revealed various perspectives regarding awareness of the importance of tree planting and maintenance, as well as views on government support and community education.

3.1 Behaviour-shaping factors for environmental awareness

According to the theory (Green, 1980) in the book Education and Health Behavior (Notoatmodjo, 2012), there are three main factors that can influence human behavior. In this study, these factors are linked to the behaviour and perceptions regarding tree planting among urban residents, which can be described as follows: predisposition factor, the level of knowledge, belief, and awareness of the community regarding the benefits of tree planting in maintaining and improving environmental quality and air quality in urban areas and residential areas needs to be developed and promoted. This development is crucial in addressing the growing concerns over environmental degradation and urban heat islands. By increasing public awareness about how trees contribute to reducing air pollution, mitigating climate change, and enhancing overall health, communities are more likely to recognize the importance of incorporating green spaces into their urban environments (Sousa-Silva et al., 2023). Furthermore, this development can foster positive attitudes and a willingness to participate in tree planting in urban and residential areas, driven by a strong belief in the benefits that trees provide, such as improving physical and mental well-being, promoting biodiversity, and increasing the aesthetic value of urban spaces. The cultivation of such attitudes can help ensure long-term community engagement in tree planting initiatives and contribute to building a culture of sustainability within urban and residential areas (Morgan & Ries, 2022).

Enabling factor, these factors influence human responses that are reflected in behavior. These factors include the availability of facilities, infrastructure, and clear information. The community needs supporting facilities and resources to be able to behave appropriately. Essentially, these facilities serve to facilitate or enable certain behaviors. Therefore, these factors are often referred to as supporting or enabling factors that facilitate behavior. Enabling factors are also very important in the context of tree planting in urban areas. The availability of land, facilities, and infrastructure can be key factors in encouraging the success of urban greening programs. Sufficient vacant land or public areas need to be provided for tree planting, while government policies should offer guidance and incentives that make it easier for the community or organizations to get involved in this initiative. Additionally, clear information about the types of trees suitable for the urban climate, proper care techniques, and the benefits of tree planting for the environment and human health is a critical trigger for community participation. Educating the community on the

long-term advantages of tree planting, such as improved air quality, reduced noise pollution, and cooling effects, further encourages engagement. With adequate supporting resources, such as access to water and gardening tools, tree planting in urban areas can be more effective and sustainable. Strong policies on the minimum area for Green Open Spaces (RTH) can also be a factor in the success of tree planting programs, ensuring that these green spaces are not only preserved but actively expanded. Collaborative efforts between local governments, community organizations, and urban planners will enhance the sustainability and success of these programs in the long run.

Reinforcing factor, in tree planting participation from the community can include government support, policies or regulations, and incentives or motivation (Rode et al., 2022). This is expected to encourage public behavior in tree planting and maintenance in urban areas. In this regard, the government can also collaborate with institutions, communities, or other companies as part of corporate social responsibility programs, sharing tree seedlings and carrying out tree planting and care together. Public-private partnerships can be highly beneficial in scaling up the impact of such initiatives and ensuring that resources are mobilized effectively. Another enabling factor that can encourage community participation in tree planting is continuous education about the importance of trees for the urban environment, such as climate change mitigation, air quality improvement, and providing habitats for local wildlife. This education program can be carried out through public campaigns, seminars, or school activities, reaching a wide audience and fostering a culture of sustainability from a young age. Additionally, the involvement of community leaders in tree planting campaigns can provide extra motivation for people to participate in this initiative, as local leaders are often seen as role models and influencers in their communities. With solid collaboration between the government, community, and private sector, tree planting in urban areas is expected to be more effective and sustainable, not only in terms of environmental benefits but also in fostering a sense of shared responsibility and ownership among residents.

3.2 Respondent characteristic

The perception of the urban community regarding participation in tree planting is influenced by the characteristics of the community. Therefore, in this study, it is important to understand the characteristics of the respondents to ensure they represent the overall population being studied. The characteristics of the respondents can be assessed based on factors such as age, gender, and the highest level of education. These characteristics are also expected to serve as parameters for understanding the factors that influence perceptions and participation in tree planting among urban residents. For instance, younger individuals may be more open to environmental initiatives, while older individuals may have a different perspective based on their experiences. Similarly, the level of education can significantly affect how well individuals understand the environmental, social, and economic benefits of tree planting. The respondents selected for this study are members of the general public who meet the criteria, specifically those who reside and settle in urban areas (Ewane et al., 2023). It is essential to ensure diversity in the respondent pool to capture a wide range of views and experiences that can offer a comprehensive understanding of community perceptions. The results of this study will thus be crucial in identifying key factors that shape the community's involvement in and attitudes toward tree planting initiatives in urban settings.

3.2.1 Age of respondent

The results of the study, based on the distribution of questionnaires to 101 respondents, revealed the following age distribution: 6.93% (7 respondents) were under 20 years old, 17.82% (18 respondents) were aged 21-30 years, 57.43% (58 respondents) were aged 31-40 years, 15.84% (16 respondents) were aged 41-50 years, and 1.98% (2 respondents) were over 50 years old. The variation in age groups among the respondents

aims to analyze perceptions and participation in tree planting in urban areas. The data obtained provides insights into how each age group views and engages in tree planting efforts in urban environments. By involving all age groups, the analysis can indicate whether there are significant differences in active participation, preferences for tree species, or reasons for involvement in urban greening activities among the different age groups. For example, younger respondents may be more likely to support innovative urban greening initiatives or eco-friendly policies, while older respondents may prioritize the practical benefits of tree planting, such as shade or environmental improvement. Furthermore, understanding these differences can help tailor future education and engagement strategies to each age group's specific interests and motivations, ensuring broader and more inclusive participation in urban greening efforts.

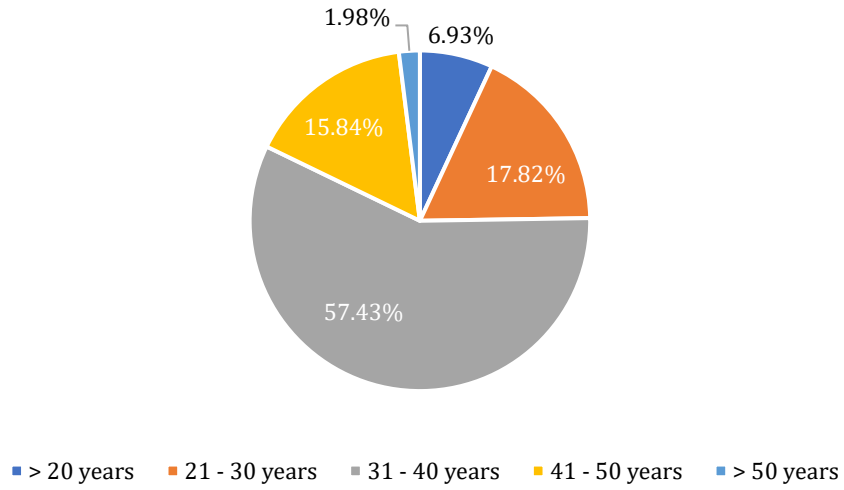

Fig. 1. Pie chart of age of respondent

3.2.2 Gender

From the data obtained, 37.62% or 38 respondents are male, and 62.38% or 63 respondents are female. In this study, the number of female respondents is higher than that of male respondents, which could reflect the gender distribution within the urban areas surveyed. The higher percentage of female respondents may also indicate greater interest or willingness among women to participate in environmental activities, such as tree planting. Gender-based differences in perceptions and participation may provide valuable insights into how each gender engages with environmental initiatives. For instance, women may be more likely to emphasize the social and health benefits of tree planting, such as improving public spaces for families and communities.

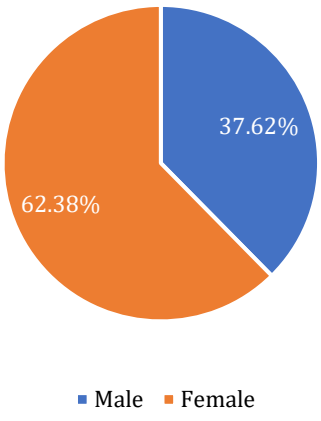

Fig. 2. Pie chart of gender

Understanding these gender-based differences can help in designing more inclusive and targeted programs to encourage participation from both males and females in urban greening efforts. Further analysis may reveal whether this gender disparity is consistent across different age groups or geographic regions within the study area.

3.2.3 Last educational background

From the data obtained, 0.99% or 1 respondent has the highest level of education as elementary school/equivalent, 1.98% or 2 respondents have the highest level of education as junior high school/equivalent, 12.87% or 13 respondents have the highest level of education as high school/equivalent, 75.25% or 76 respondents have the highest level of education as diploma/bachelor's degree, and the remaining 8.91% or 9 respondents have the highest level of education as master's/doctoral degree. By analyzing perceptions and participation based on education levels, it is expected to provide insights and information about how environmental knowledge is received and implemented by various segments of society. For instance, individuals with higher levels of education, such as those with a bachelor's or master's degree, may have a more informed and analytical approach to the benefits of tree planting, understanding the broader environmental, economic, and social implications. In contrast, respondents with lower levels of education may be more focused on immediate and tangible benefits, such as improving air quality or providing shade. This variation in perspectives can help design more effective environmental education and outreach programs, adjusting approaches according to the understanding and educational needs of each group. For example, simpler, more accessible information could be provided to those with lower education levels, while more detailed, research-based content could be targeted at those with higher education levels. This tailored approach can foster greater community participation and increase the overall impact of urban greening initiatives.

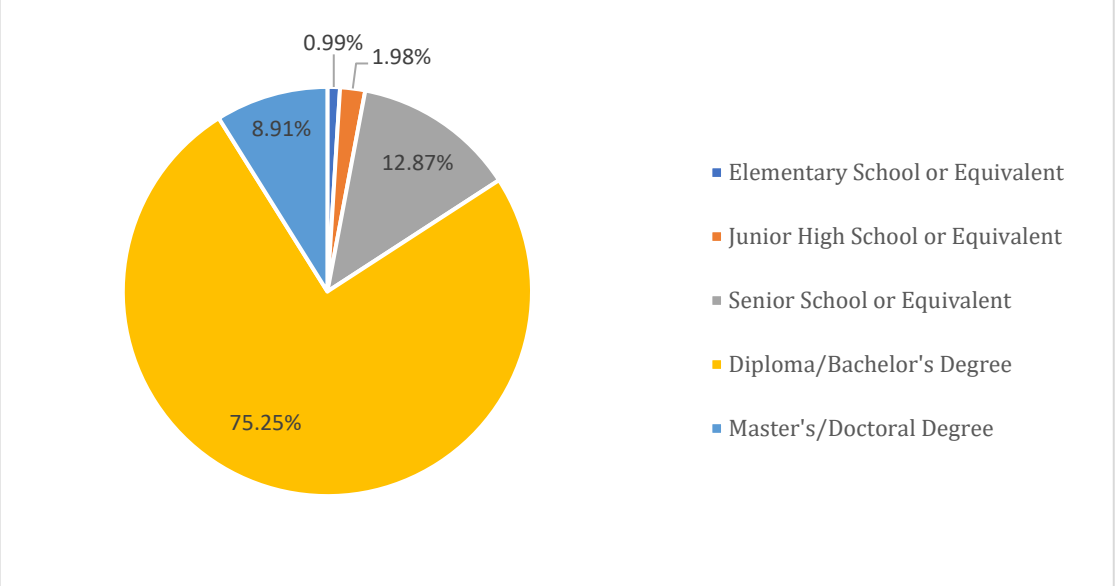

Fig. 3. Pie chart of last educational background

3.3 Community perception on the benefits of tree planting

The results of the study, based on the distribution of questionnaires to 101 respondents, indicate that respondents are aware of the important role trees play in improving air quality. Trees are recognized for their ability to absorb carbon dioxide and other harmful emissions, while producing oxygen through photosynthesis, which has a positive impact on daily life. This awareness reflects a growing understanding of the environmental benefits of urban greenery, including mitigating air pollution, reducing the urban heat island effect, and enhancing overall public health. The respondents' recognition

of these benefits underscores the importance of trees not only in enhancing the aesthetic value of urban spaces but also in providing essential ecosystem services that contribute to a healthier and more sustainable urban environment. Furthermore, this awareness may translate into increased public support for tree planting initiatives, as people understand how these efforts directly improve their quality of life, reduce health risks associated with air pollution, and create a more liveable urban atmosphere.

Table 1. The perception of the community on the benefits of tree planting

No	Question	Yes	No	No Idea
1	Do you know that trees have benefits in improving air quality by absorbing emissions and producing oxygen?	88.12%	10.89%	0.99%
2	Do you use tree planting for harvesting fruits or leaves for food?	96.04%	3.96%	0.00%
3	In your opinion, do trees have benefits in preventing floods?	77.23%	11.88%	10.89%
4	In your opinion, do trees play an important role in maintaining the balance of the urban ecosystem?	100.00%	0.00%	0.00%
5	In your opinion, can tree planting help reduce the impacts of climate change?	97.03%	2.97%	0.00%

Based on Table 1, it can be described that the perception of the urban population regarding the benefits of tree planting is quite good. Specifically, 89 respondents out of 101, or 88.12%, stated that trees have the benefit of improving air quality through emission absorption and producing oxygen. Additionally, 97 respondents out of 101, or 96.04%, mentioned that trees can provide fruits or leaves for food. Furthermore, 78 respondents out of 101, or 77.23%, believe that trees are beneficial for flood prevention. All 101 respondents, or 100%, affirmed that trees play a vital role in maintaining the balance of the urban ecosystem. Lastly, 98 respondents out of 101, or 97.03%, expressed that tree planting can help reduce the impacts of climate change. Based on the data processing results from the questionnaire, the predisposition factor, which is the public's awareness of the benefits of tree planting, is very good. This can be interpreted as the people living in urban areas already having a good understanding of the benefits of tree planting in the urban area or in the area around their place of residence.

3.4 Community perception on government involvement in tree planting

Based on the factors that influence the environmental caring behavior, enabling factors are one of the determinants that trigger awareness to improve environmental care, which in this study refers to enhancing tree planting behavior in urban areas. The enabling factors in this study are the availability of land and the availability of urban parks for tree planting.

3.4.1 Local government involvement in supporting tree planting programs

Based on the research findings, 22.77% or 23 respondents stated that the local government has been sufficiently supportive of tree planting programs in urban areas, 50.50% or 51 respondents stated that the local government has not been sufficiently supportive of tree planting programs in urban areas, and 26.73% or 27 respondents were unaware of whether the local government has a sufficiently good program supporting tree planting in urban areas. These findings highlight a notable gap in public perception regarding the effectiveness of local government support for urban greening initiatives. While a portion of the respondents acknowledges the government's efforts, a significant number feels that the support is inadequate, which may reflect concerns over insufficient funding, lack of policy enforcement, or limited public awareness of existing programs. Additionally, the high percentage of respondents unaware of government initiatives suggests that communication and outreach about tree planting programs may be lacking. This information can serve as a valuable indicator for local authorities to reassess their strategies for promoting tree planting, ensuring that the community is not only supported

through policies and incentives but also well-informed about the resources and opportunities available for participation in these initiatives.

Table 2. Community perception on government involvement in tree planting

No	Question	Yes	No	No Idea
1	Has the local government provided sufficient support for tree planting programs in your area?	22,77%	50,50%	26,73%

3.4.2 Tree planting in city park

Based on the research findings, it was found that respondents perceive tree planting in city parks as insufficiently adequate, with 89.11% or 90 respondents indicating this. Meanwhile, 9.90% or 10 respondents stated that tree planting in city parks is sufficiently adequate, and 0.99% or 1 respondent was unsure. This overwhelming perception of insufficiency suggests that there may be a gap in the planning, execution, or maintenance of tree planting efforts in urban parks. The high percentage of respondents expressing dissatisfaction could indicate concerns over the lack of green spaces, poor tree care, or insufficient variety in tree species within city parks. Additionally, this finding could highlight a broader issue of limited funding or resources allocated to urban greening projects. Addressing these concerns may involve increasing investment in public green spaces, improving park infrastructure, and engaging the community in the planning and maintenance of urban parks. Public feedback could be instrumental in shaping future initiatives that meet the expectations and needs of city residents.

Table 3. The perception of tree planting in city park

No	Question	Yes	No	No Idea
1	Do you think tree planting in public parks is adequate in your city or area?	9.90%	89.11%	0.99%

3.4.3 Involvement of schools or educational institutions

Based on the research findings, it was found that people living in urban areas perceive that the involvement of schools or educational institutions plays an important role in instilling the importance of planting trees and caring for them from an early age. Specifically, 76.24% or 77 respondents out of 101 respondents stated that it is very important, while 23.76% or 24 respondents stated that it is important. This high level of agreement underscores the critical role education plays in shaping environmental consciousness and fostering a sense of responsibility for urban greening efforts. By incorporating tree planting and environmental stewardship into school curricula and activities, educational institutions can significantly influence students' attitudes toward sustainability (Akinsemolu & Onyeaka, 2025). The fact that the majority of respondents emphasize the importance of early education suggests that promoting environmental awareness from a young age can lead to more engaged and proactive citizens who are committed to preserving and enhancing green spaces in their communities.

Table 4. The perception of involvement of schools or educational institutions

No	Question	Very Important	Important	Fairly Important	Not Important
1	What are your thoughts on the involvement of schools or educational institutions in teaching the importance of planting trees?	76.24%	23.76%	0.00%	0.00%

The research shows that the involvement of local governments in supporting tree planting programs in urban areas is still considered inadequate by most respondents.

Meanwhile, many respondents believe that the involvement of schools or educational institutions is very important in instilling awareness about the importance of tree planting and care from an early age. Additionally, tree planting in city parks is still deemed insufficient, indicating the need for an increase in greening programs in urban open spaces.

3.5 Public perception of disadvantages and barriers

Despite the significant benefits provided by trees, such as carbon absorption, improved air quality, and providing habitats for flora and fauna, there are several disadvantages or barriers that need to be considered. One of these is the limited land available for development due to the need for space to plant trees. Additionally, the presence of trees in urban areas often leads to problems such as areas becoming dirty from fallen leaves, increased maintenance costs to maintain tree health, and potential damage to buildings caused by strong tree roots that can damage foundations (Czaja et al., 2020). Moreover, the lack of public awareness regarding the importance of tree care and the insufficient support from the government in providing adequate green spaces often worsens these conditions. The land that should be used for buildings or other open spaces is becoming increasingly limited, while trees that are not properly managed can lead to structural and environmental issues. Therefore, despite the numerous benefits that trees offer to the environment, wise management and greater attention to their negative impacts are essential to achieving an optimal balance (Samal & Dash 2023).

3.5.1 Barriers to tree planting in urban areas

Based on the data shown in Figure 4, the results indicate that 59.41% or 60 respondents of 101 respondents stated that the lack of available land in urban areas is the biggest obstacle to tree planting in urban areas. Furthermore, 26.73% or 27 respondents mentioned that the low level of public awareness regarding the importance and numerous benefits of tree planting is another significant barrier, while 13.86% or 14 respondents pointed out that the insufficient support from the government in encouraging active participation from urban residents in tree planting is also a barrier. The conclusion is the limited availability of land is the main obstacle to tree planting in urban areas. Furthermore, the low public awareness of the benefits of tree planting exacerbates the situation. The lack of government support also affects the active participation of the community in maintaining the sustainability of urban greening efforts

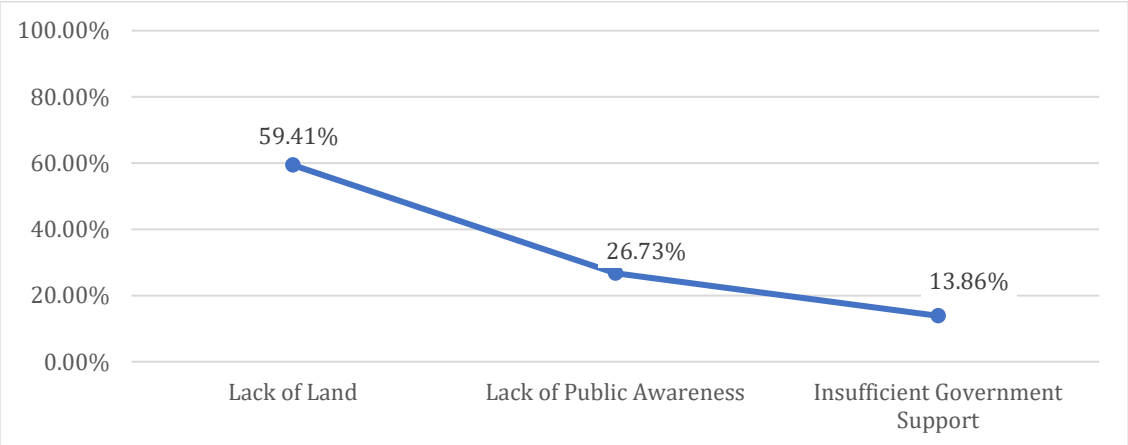

Fig. 4. Public perception of barriers to tree planting in urban areas

3.5.2 The disadvantages caused by tree planting in urban areas

Based on the data shown in figure 5, the results reveal that 18.81% or 19 respondents out of 101 respondents reported that tree planting in urban areas has disadvantages, such

as the area becoming dirty due to fallen leaves. 28.71% or 29 respondents indicated that there are additional costs for tree maintenance, including purchasing fertilizers and other related expenses. 42.57% or 43 respondents mentioned that tree planting in urban areas can be disadvantageous because some trees have strong roots that may damage nearby buildings, including roads and sidewalks. 0.99% or 1 respondent noted that tree planting reduces land available for construction, and 8.91% or 9 respondents stated that there are no disadvantages from tree planting in urban areas.

The majority of respondents identified several potential drawbacks of tree planting in urban areas. The main concern highlighted was the possibility of infrastructure damage, such as roads and sidewalks, due to the strong and invasive roots of trees. This is a concern for residents who are worried about the costs of repairing both public and private infrastructure. Additionally, most respondents also felt that the maintenance costs of trees, such as purchasing fertilizers and routine upkeep, add an extra burden to the urban budget or the community.

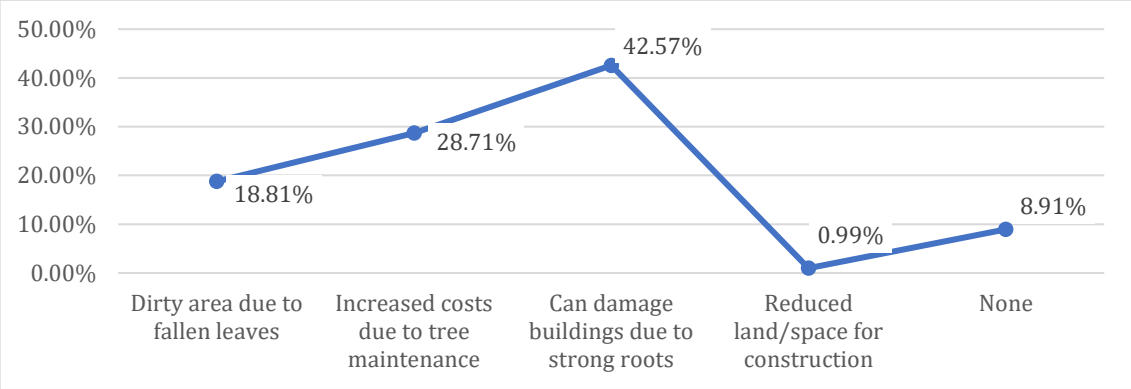

Fig. 5. Public perception of the diadvantages of tree planting

In addition to concerns about infrastructure and costs, there are also negative perceptions related to aesthetics and environmental cleanliness, as the fallen leaves from trees are considered to dirty the surrounding area (Ignell et al., 2025) However, only a small number of respondents believe that the presence of trees could reduce land available for development. Despite these views on the drawbacks, a small portion of respondents still believe that tree planting does not have any negative impact, indicating that the benefits of having trees in urban areas are still recognized by some.

From the results of the conducted questionnaire, the 31-40 age group showed the most active participation in tree planting activities, whereas the younger age group was less active. This highlights the need for active roles from the government and other relevant parties to upgrade the awareness and encourage for the younger generation to develop a stronger interest in environmental issues, particularly active participation in tree planting. Based on gender groups, female respondents tend to have a higher awareness of the importance of tree planting compared to male respondents. However, male participation in the physical activities of tree planting is relatively more dominant. This presents an opportunity for greater synergy to optimize tree planting programs. Based on education levels, respondents with higher education levels tend to have a better understanding of tree planting and its benefits for ecosystem and environmental sustainability. Therefore, practical participation in tree planting indicates the need for relevant communication strategies from related parties to effectively target each educational level. This analysis illustrates that the success of tree planting programs heavily depends on approaches to the characteristics of respondents. Targeted environmental education programs and campaigns are needed to address gaps in awareness and participation, as well as specific incentives to encourage younger age groups and respondents with lower education levels to become more actively involved in environmental activities.

4. Conclusions

Perceptions, awareness, and motivation regarding tree planting in urban areas can vary depending on several factors, such as age, life experiences, and levels of environmental understanding and knowledge. In this study, urban residents's perceptions of tree planting reflect diverse views that highlight both the benefits and potential drawbacks of this greening program. Many people understand the importance of trees in urban areas for improving air quality, reducing global temperatures as part of climate change mitigation, and beautifying urban environments, which are predominantly filled with buildings, houses, and other infrastructure. This awareness reflects the high appreciation for the ecosystem services that trees provide, such as absorbing emissions and producing oxygen, which greatly benefit the quality of life in cities. However, alongside these benefits, there are still challenges that may hinder the widespread success of tree planting programs in urban areas.

The main obstacles perceived by urban residents in tree planting are limited land and maintenance costs. The lack of available land, caused by the high density of building constructions and other infrastructure in cities, presents a serious challenge to the development of green spaces. Additionally, the public faces additional costs required for tree care, such as pruning, watering, and fertilizing. Another often highlighted disadvantage is the damage to infrastructure caused by the strong roots of trees, which can damage buildings, sidewalks, and roads. These factors lead many people to question the long-term effectiveness of tree planting in urban areas, even though they still recognize the environmental benefits provided by trees.

Furthermore, public perceptions are also influenced by the support they feel from the government. This research shows that many people feel the government's support for tree planting programs is still inadequate, both in terms of policies and assistance in overcoming existing barriers. This indicates that the government's role needs to be strengthened, both through the provision of dedicated land for urban greening and through incentive policies that encourage the public to participate more actively. Community involvement and social programs can also be solutions to overcome the challenges faced.

Overall, although there are challenges in tree planting among urban residents, public awareness of the importance of tree planting in urban areas remains high. Tree planting efforts can succeed if supported by appropriate management strategies, such as better infrastructure maintenance and collaboration from the government in the form of policies that support environmental sustainability, as well as partnerships with the private sector for joint efforts in urban tree planting. Additionally, broader education about the benefits of trees and their care will help increase public participation and address negative perceptions related to the disadvantages of tree planting in urban areas.

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Author Contribution

The author solely conducted all aspects of this study, including conceptualization, research, data collection, analysis, and writing. Every part of the article, from the initial idea to the final manuscript, was independently developed and completed by the author.

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