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Spatial Planning and Sustainable Development: Strengthening Environmental Management Through Pro-Environmental Human Resource Behavior in Medan City

Mohammad. Yusri[1], Kholilul Kholik[2], Siti Hajar[3]
[1]Faculty of Agriculture, Agribusiness Study Program, Universitas Islam Sumatera Utara
[2]Management Science Study Program, Universitas Pembangunan Panca Budi
[3]Public Administration Science Study Program, Universitas Muhammadiyah Sumatera Utara
Email: mohdyusri@fp.uisu.ac.id

Abstract
Climate change and environmental degradation have become global challenges that require individuals and organizations to adopt more environmentally friendly behavior. In Medan City, green economic development is one solution to achieve environmental sustainability. Involving Human Resources (HR) with pro-environmental behavior is a must to achieve this goal. This study aims to analyze environmental management based on sustainable development by emphasizing the pro-environmental behavior of human resources (HR) in Medan City. This study uses a survey method with a quantitative approach. The quantitative approach is used to measure the level of knowledge, attitudes, and pro-environmental actions of the community and the factors that influence them. Furthermore, a SWOT analysis is applied to formulate a strategy for strengthening sustainable environmental management by mapping the strengths, weaknesses, opportunities, and threats faced. The results of the study indicate that the variables of education level, environmental awareness, and government regulatory support have a significant influence on pro-environmental behavior. The SWOT analysis reveals that great potential in increasing HR capacity and multi-party collaboration can be optimized to strengthen sustainable environmental governance.
Keywords: *Environmental Management, Sustainable Development, Pro-Environmental Behavior, Human Resources.*

INTRODUCTION

Climate change and environmental degradation have become global challenges that require every individual and organization to adopt more environmentally friendly behavior. Environmental management is a crucial aspect in efforts to realize sustainable development. In this context, an approach that places human resources (HR) as the subject of change has strategic urgency, considering that human behavior is the main determinant in achieving sustainable development goals. According to the United Nations Environment Programme (UNEP, 2022) report cited by (Sánchez-García et al., 2025), global environmental degradation has increased significantly due to human activities, with more than 60% of the world's ecosystems experiencing a decline in their ecological function in the last five decades. Therefore, the transformation of individual and collective behavior towards more pro-environmental actions is the main foundation in sustainability-based environmental management. According to (Iftikar et al., 2022; Raman et al., 2024) pro-environmental behavior is defined as a conscious individual action aimed at minimizing negative impacts on the environment and supporting ecosystem sustainability. A study by (Prasetyo et al., 2024) identified four main forms of pro-environmental behavior, namely sustainable consumption, waste management, energy efficiency, and involvement in environmental advocacy. These behavioral changes do not occur instantly, but rather through a process of internalizing values, increasing environmental literacy, and strengthening social norms and supportive policies. In Indonesia, the urgency of changing human resource behavior in environmental management is very relevant, especially considering data from the Central Statistics Agency in 2023 which shows that national waste production reaches 34.5 million tons per year, with more than 40% not being managed adequately. This has serious implications for air, water, and soil quality, and increases the risk of ecological disasters (Kurniawan et al., 2022). The government through the Ministry of Environment and Forestry (KLHK) has developed various initiatives to encourage community participation, such as the Climate Village, Waste Bank, and Adiwiyata School programs. However, the effectiveness of these programs is highly dependent on the capacity and willingness of the community to implement environmentally friendly behavior in their daily lives. According to (Esponda Perez et al., 2024; Iftikar et al., 2022; Mamun et al.,

2024) it is emphasized that pro-environmental behavior of human resources can be strengthened through an education and incentive-based approach. Environmental education from an early age has been shown to increase ecological awareness, while fiscal and non-fiscal incentives can accelerate the adoption of sustainable practices at the household and industrial levels. In addition, the use of digital technology such as pollution reporting applications, air quality monitoring, and resource sharing platforms is also an important driver in changing the behavior of urban communities.

Meanwhile, from a sustainable development perspective, (Buzinske, 2024; Joesidawati & Suwarsih, 2022) that the success of environmental management is closely related to social and economic indicators. When people have access to education, decent work, and basic services, the tendency to behave in an environmentally friendly manner will increase. Therefore, according to (B.Sh Babakhanova; Kh.L, Pulatov, 2019; Tuthaes et al., 2024; Valdivieso, 2019) integration of cross-sector policies is a must, including synergies between education, health, employment, regional planning, and environmental protection. Thus, environmental management based on sustainable development cannot be separated from the active role of human resources as agents of change. Pro-environmental behavior supported by knowledge, attitudes, and sustainability values is an essential component in building an ecologically resilient society. For this reason, strategies for strengthening human resource capacity, reformulating behavior-based policies, and supporting digital innovation are key steps in realizing a sustainable environmental future. Environmental management amidst the challenges of rapid urbanization in Medan City requires an innovative approach that integrates the principles of sustainable development. The main focus of this approach is the pro-environmental behavior of human resources (HR). Based on literature reviews, individual behavior in the environmental context can be influenced by various factors, including education, awareness of environmental issues, and public policies that support sustainable actions (Fadhlinsyah et al., 2023; Sharma et al., 2025). The Sustainable Development Goals (SDGs) emphasize the importance of education and strengthening community capacity to facilitate active participation in environmental management. In the context of Medan, environmental education programs for the community and industrial workers are very relevant. Research by (Mahruf et al., 2024; Surata & Vipriyanti, 2018) shows that effective environmental education encourages positive behavioral changes towards environmental practices.

Medan City as one of the fastest growing cities in Indonesia, Medan faces significant challenges in waste and pollution management. Sustainable policies implemented by the local government, such as community-based waste management, can strengthen pro-environmental behavior in individuals (Al-Sabi et al., 2024). Research by (Hajar et al., 2024; Schwann, 2018) that pro-environmental behavior is not only influenced by policies, but also cultural aspects and local values. Therefore, the integration of local values into environmental programs can increase effectiveness and community acceptance. Clear communication about the environmental and social benefits of pro-environmental actions is also crucial (Gu et al., 2024). However, despite various initiatives, challenges such as lack of facilities and infrastructure to support pro-environmental behavior remain. Studies by (Ganea, 2020; Lian & Li, 2024; Sampene et al., 2024) show that without adequate infrastructure support, pro-environmental behavior in the community will be difficult to realize. This shows the importance of collaboration between the public, private, and community sectors in creating an environment that supports sustainable behavior. This study offers effective environmental management in Medan City not only depends on the environmental policies implemented, but also on strengthening human resource behavior through education and active community involvement. Consistent actions by the government to insert environmental aspects into every sectoral policy will be able to create positive synergy. Further research is also recommended to explore the impact of information technology in increasing environmental awareness and pro-environmental behavior in urban communities. Thus, it is important to formulate a holistic strategy in environmental management that does not only focus on technical aspects but also develops sustainable pro-environmental behavior among the people of Medan City. These steps are expected to create a balance between economic growth and environmental sustainability, thereby realizing sustainable development for future generations.

Sustainable environmental management in Medan City faces a series of complex challenges rooted in human resource behavior as well as existing social, economic, and public policy structures. The main issues of concern are the lack of discipline and low public awareness of environmental issues, which have negative impacts on the sustainability of ecosystems and the quality of life in the city. First, the rapid

growth of urbanization in Medan, along with the increasing population, has created great pressure on natural resources and environmental infrastructure. This was recognized by the Central Statistics Agency, in 2021, which showed the high volume of waste and air pollution produced. This situation has direct implications for public health and environmental sustainability. Although the city government has launched waste management and cleanliness programs, their effectiveness is often hampered by the lack of active participation from the community. Second, low environmental education in the community is a significant factor influencing pro-environmental behavior. Research (Koupatsiaris & Drinia, 2024) highlights the importance of education as a tool to increase environmental awareness. However, the lack of access to effective environmental education programs results in the community not having sufficient knowledge and information regarding sustainable actions. This is a challenge in creating the expected pro-environmental behavior. Third, cultural aspects and local values influence people's perceptions of the environment. As stated by (Anshima et al., 2025), dominant social values can encourage or even inhibit pro-environmental behavior. In Medan, where local traditions and cultures are very diverse, the integration of local values and environmental management efforts is a challenge. Without an approach that is sensitive to local culture, environmental programs tend not to get maximum support and participation from the community. Fourth, public policies in Medan are often not well integrated to support the development of pro-environmental behavior. Although there are policies that regulate the management of natural resources and the environment, the lack of consistent implementation and collaboration between the government, private sector, and the community results in unsustainable ecological activities. (Gonzalez-Urango & García-Melón, 2018; Prasetyo et al., 2024; Tuthaes et al., 2024) noted that adequate infrastructure support and collaboration between various stakeholders are crucial in encouraging individual behavioral changes towards pro-environmental actions. In addition, challenges in terms of communication are also a concern. Information related to the benefits of pro-environmental actions is often conveyed in a way that is less attractive or difficult for the general public to understand. Overall, the main problem in environmental management in Medan City lies in the integration of policies, education, and community behavior. A holistic and collaborative approach is needed to create synergy between the government, community, and private sector in achieving sustainable environmental management goals. Therefore, greater attention should be given to developing environmental education programs, supporting community participation, and involving local values in every environmental initiative. These efforts are expected to encourage pro-environmental behavior that can support sustainable development in Medan City. Thus, this study aims to explore and analyze the interaction between pro-environmental behavior of human resources and sustainable environmental management in Medan City. This objective can be seen from the identification of various factors, both in terms of individuals, social, economic, and public policy, that influence pro-environmental awareness and actions among the people of Medan City. Through this approach, it is hoped that a deeper understanding can be obtained regarding the obstacles and opportunities in creating sustainable behavior. This study also focuses on the importance of integrating local cultural values in environmental management initiatives. By understanding how local values interact with environmental efforts, this study aims to formulate an approach that is more appropriate and acceptable to the people of Medan. Thus, this study aims to provide a real contribution to the development of strategies and policies that can encourage sustainable environmental management through pro-environmental behavior, which can ultimately improve the quality of life of people in Medan City.

LITERATURE REVIEW

Sustainable environmental management is becoming an increasingly pressing global issue, especially in the context of rapid urbanization. In Medan City, with increasing population and industrialization, the challenges in environmental management are becoming increasingly complex. This study focuses on the importance of pro-environmental behavior of human resources in supporting environmental management based on sustainable development. The concept of sustainable development has become an important paradigm in the approach to resource management and global public policy, which integrates economic, social and environmental aspects. Sustainable development is emphasized by (Zhu et al., 2022; Zhuang et al., 2024) as development that meets the needs of the present without sacrificing the ability of future generations to meet their own needs. Furthermore, KKK also defines sustainable development as including three main pillars, namely economic growth, social justice and environmental conservation.

Meanwhile, (Buzinske, 2024) also explains the three pillars of sustainable development, as follows: 1) economic aspects, namely sustainable economic development aims to create inclusive and equitable growth, so that all levels of society can enjoy its benefits. Economic growth should not only focus on increasing gross domestic product (GDP), but also on the quality of life of the community; 2) social aspects, in sustainable development emphasize the importance of social justice and poverty eradication. This includes community empowerment, access to education, health and public services, and participation in the decision-making process; and 3) environmental aspects, namely environmental conservation related to the wise management of natural resources to maintain ecosystems and prevent environmental damage. This includes reducing greenhouse gas emissions, conserving biodiversity, and protecting water resources. (Beisheim et al., 2018; Bortnyk et al., 2024) stated that the Sustainable Development Goals (SDGs) adopted by the UN in 2015, provide a comprehensive global framework for sustainable development, with 17 goals covering issues related to poverty, health, education, gender equality, and climate change. This study also specifically covers several SDGs goals, namely health, education, climate change and the environment. However, in theory and practice in sustainable development in environmental management there are still various challenges, one of which is the conflict between economic growth and environmental conservation. As emphasized by (Larik & Singh, 2017) shows that there is often tension between economic needs and environmental sustainability. This is because the theory of sustainable development is an important foundation in formulating policies and practices that aim to create a balance between economic growth, social justice, and environmental preservation. With a better understanding of the aspects that form this theory, it is hoped that resource management efforts can be carried out effectively and inclusively, leading to sustainable development that is sustainable for future generations.

In accordance with this explanation, it is very important to have pro-environmental behavior which refers to individual or group actions aimed at protecting and improving the environment. In the context of sustainable development, this behavior is very important because it directly contributes to the achievement of sustainability goals which include a balance between economic growth, social justice, and environmental preservation. According to (Yeremeyev et al., 2021), pro-environmental behavior encourages people to get involved in environmental management, such as participating in environmental cleanup programs or planting trees. This involvement increases awareness and social responsibility towards environmental issues, including people who demonstrate pro-environmental behavior are often more aware of the environmental impacts of their actions. Effective environmental education helps build the knowledge and values needed to support sustainable action. Meanwhile, Ajzen's Theory (Ansari & Khan, 2024) especially the theory of planned behavior, states that a person's intention to carry out an action (in this case, pro-environmental behavior) is influenced by attitudes towards the behavior, subjective norms, and perceived behavioral control. Therefore, in this study to understand the factors that influence pro-environmental intentions and actions is very important to formulate effective interventions. One of the factors that influence pro-environmental behavior is education, as emphasized by KKK that the importance of environmental education to raise public awareness and knowledge about environmental issues. In addition, cultural values also play an important role in pro-environmental behavior in Medan City, this is because the traditions and norms of society can be valuable assets in promoting greater environmental awareness. Therefore, the results of this study can include local values that can be integrated into environmental programs. Thus, sustainable development does not only focus on environmental aspects, but also on social and economic welfare. Pro-environmental behavior can create new opportunities in the green economy sector and support job creation, because pro-environmental behavior is a critical component in sustainable development. By encouraging environmentally responsible actions at the individual and community levels, we can ensure that natural resources are maintained for future generations, and achieve the necessary balance between economic, social, and environmental needs.

Environmental education programs have become an important instrument in encouraging pro-environmental awareness and behavior. Evaluation of the effectiveness of these programs, such as those conducted by (Prasetyo et al., 2024) shows that well-designed programs can increase community knowledge and involvement in environmental issues. Likewise, the development of this education program in Medan City is very important in building pro-environmental behavior among the community, thus leading to greater participation in the community in efforts to protect the environment. Efforts to

support this program, it is important for the government to know and understand that environmental education is an important component in forming pro-environmental behavior that is supported by various policies and environmental management measures that have been established, including in Medan City. However, if the policy is not implemented properly or does not involve community participation, its effectiveness will be hampered. This is in accordance with the results of research from (Al-Sabi et al., 2024; Yasril & Nur, 2018) which found that the lack of community participation in environmental management is a major obstacle to achieving sustainability goals. This suggests the need for a more inclusive approach to environmental policy formulation, where communities are involved in the decision-making process.

The theory of pro-environmental behavior provides an important foundation in understanding how communities in Medan City can contribute to sustainable environmental management. By integrating various existing theories and approaches, more effective intervention strategies can be developed, such as environmental education, community engagement programs, and strengthening local values. These efforts are expected to contribute to encouraging stronger pro-environmental behavior, thereby supporting environmental sustainability in Medan City. Pro-environmental behavior is a critical component of sustainable development. By encouraging environmentally responsible actions at the individual and community levels, we can ensure that natural resources are maintained for future generations, and achieve the necessary balance between economic, social, and environmental needs.

METHOD

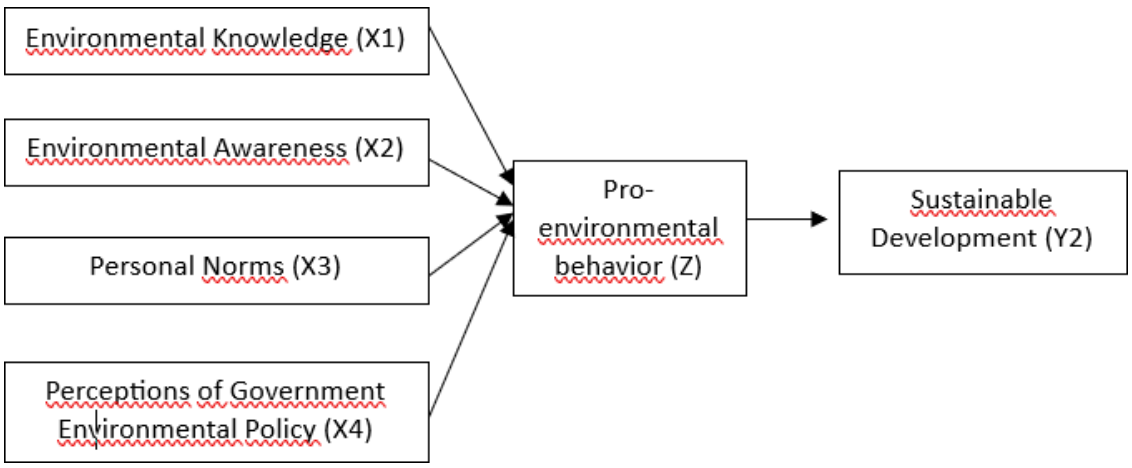
This study uses a quantitative approach. This method was chosen because it is able to produce statistical analysis so that it is possible to draw more generalizable conclusions regarding the pro-environmental behavior of human resources in realizing sustainable development in Medan City. (Gorard, 2018) that this approach also provides an opportunity to compare various variables and identify relationships between factors that influence pro-environmental behavior, which is very important in the context of environmental management. The quantitative approach in this study uses a survey method that is used to collect, analyze and interpret numerical data that can provide objective insight into certain phenomena. According to (Kultar Singh, 2007) this method is also often used to understand the opinions, behaviors or characteristics of a wider population by taking data from representative samples. (Creswell, 2014) that in collecting data in this study, questionnaires were distributed to facilitate the qualification process and statistical analysis. To measure the questionnaire, a Likert scale was used, as explained by (Joshi et al., 2015) that the Likert scale is one of the most common types of measurement scales used in quantitative research to measure a person's attitude, opinion or perception of a statement. The population in this study is the productive population of Medan City aged around 15-54 years, namely 1522373. The sampling technique used in this quantitative study is probability sampling, namely simple random sampling based on the number of productive population of Medan City in 2023. Based on the population studied, the unit of analysis in this quantitative study is the productive age. So, in determining the number of samples from the population in each locus, the theory of Isaac and Michael (Ahmad et al., 2023) was carried out, for error rates of 1%, 5% and 10%. Thus, the number of research populations is 1522373 people, so the 5% error is 76 people, so the sampling in this study is 76 people.

1. Then, the survey results in this study were analyzed quantitatively using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) approach with the help of SmartPLS software version 4 (Ulupui et al., 2024). SEM-PLS was chosen as the analysis technique because it is suitable for research with small to medium sample sizes, and is able to handle complex structural models with several latent constructs and indicators. In addition, SEM-PLS is effective for testing causal relationships between latent variables simultaneously, and can be used even though the data is not strictly normally distributed. SEM-PLS analysis was carried out in two stages (Montalvo-Falcón et al., 2023), namely:
2. 1. Testing the measurement model (outer model) to assess convergent validity (with factor loading values> 0.7 and AVE> 0.5), discriminant validity, and construct reliability (with composite reliability values and Cronbach's alpha> 0.7).
3. 2. Testing the structural model (inner model) to evaluate the relationship between latent variables through path coefficients, determination coefficients (R2), and significance levels based on the t-test using the bootstrapping technique.

The results of this analysis are used to test hypotheses and provide strategic policy recommendations in environmental management that supports sustainable development in Medan City, by prioritizing the active role and pro-environmental behavior of human resources. After data analysis using the Structural Equation Modeling Partial Least Squares (SEM-PLS) approach, a SWOT analysis was conducted to obtain a mapping of strengths, weaknesses, opportunities, and threats to the implementation of environmental management that supports sustainable development in Medan City.

CONCEPTUAL FRAMEWORK AND RESEARCH HYPOTHESIS

This study is based on the sustainable development paradigm that emphasizes the importance of integration between environmental, social, and economic aspects in every development process. In the context of environmental management, pro-environmental behavior of human resources (HR) is one of the keys to the successful implementation of sustainable environmental policies. Sustainable development requires the active involvement of all elements of society, especially human resources (HR), in maintaining a balance between economic growth, environmental conservation, and social welfare. In this context, pro-environmental behavior of HR plays a role as the main driver of achieving environmental management practices that support sustainable development. This behavior is not formed spontaneously, but is influenced by a number of internal and external factors, such as environmental knowledge, ecological awareness, personal norms, and perceptions of government policies. Based on a literature review and ecological behavior models (Al-Sabi et al., 2024; Prasetyo et al., 2024; Yeremeyev et al., 2021), a conceptual framework is prepared that describes the relationship between psychological variables and HR perceptions with the ultimate goal of Sustainable Development (Y2). In this model, Pro-Environmental Behavior (Y1) is positioned as a mediating variable that connects exogenous variables with sustainable development.



Based on the conceptual framework, the hypotheses proposed in this study are as follows:

1. H1: Environmental knowledge has a positive and significant effect on HR pro-environmental behavior.
2. H2: Environmental awareness has a positive and significant effect on HR pro-environmental behavior.
3. H3: Personal norms have a positive and significant effect on HR pro-environmental behavior.
4. H4: Perception of government environmental policies has a positive and significant effect on HR pro-environmental behavior.
5. H5: HR pro-environmental behavior has a positive and significant effect on sustainable development.
6. H6: Pro-environmental behavior mediates the effect of environmental knowledge on sustainable development.
7. H7: Pro-environmental behavior mediates the effect of environmental awareness on sustainable development.
8. H8: Pro-environmental behavior mediates the effect of personal norms on sustainable development.

9. H9: Pro-environmental behavior mediates the effect of perception of environmental policies on sustainable development.

RESULTS AND DISCUSSION

Environmental management based on sustainable development is very important in the context of Medan City, which is experiencing rapid growth in both population and industrialization. Sustainable development not only aims to improve the quality of life of the community, but also to maintain the balance of the ecosystem. Pro-environmental behavior of human resources is one of the keys to achieving this goal. Sustainable development is an important paradigm in environmental management that aims to meet the needs of the present generation without sacrificing the ability of future generations to meet their needs. This concept emphasizes the interdependence between economic development, social welfare, and environmental conservation. In Medan City, the analysis of environmental management based on sustainable development is very relevant considering the rapid population growth and industrialization. The results of the survey conducted in this study can be described according to the indicators used as measures, namely the level of knowledge, attitudes and pro-environmental actions of the Medan City community and the factors that influence the realization of sustainable development. Based on data from 76 respondents, the majority of respondents were male (55.3%), while women were 44.7%. In terms of age, the largest group is in the 25–34 age range (39.5%), followed by those aged <25 years (26.3%). Based on the type of work, the largest respondents came from students (32.9%), followed by the private sector (26.3%) and civil servants (19.7%).

Table 1. Respondent characteristics

Kategory	Sub-Kategory	Frequency (n)	Percentage (%)
Gender	Male	42	55.3%
	Famale	34	44.7%
Age	< 25 year	20	26.3%
	25–34 year	30	39.5%
	35–44 year	18	23.7%
	> 44 year	8	10.5%
Job	Student	25	32.9%
	PNS	15	19.7%
	Private	20	26.3%
	Entrepreneur	10	13.2%
	etc	6	7.9%

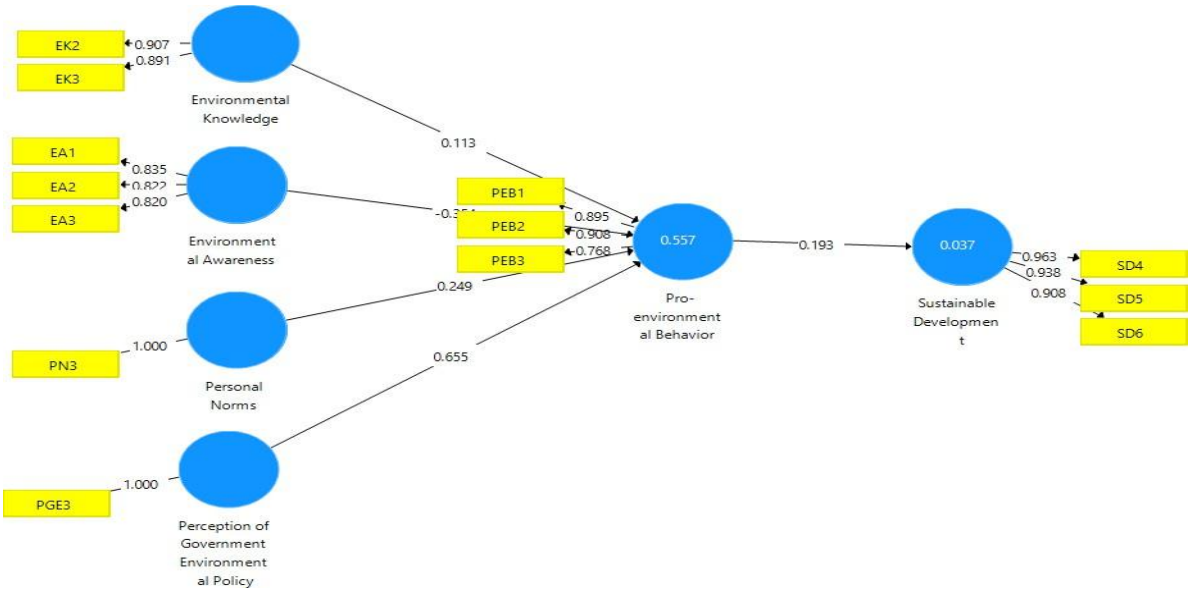


Figure 1. Structural Equation Model

Based on the outer loading results, all indicators in the model have values above 0.70, indicating that each indicator has very good convergent validity in reflecting its construct. Indicators in the Environmental Awareness variable (EA1–EA3) have loadings between 0.820–0.835, while Environmental Knowledge (EK2 and EK3) show high values of 0.907 and 0.891. Pro-environmental Behavior indicators (PEB1–PEB3) are also valid with loadings between 0.768–0.908. Likewise, single indicators in the Perception of Government Environmental Policy (PGE3) and Personal Norms (PN3) variables have perfect loadings of 1.000, and Sustainable Development indicators (SD4–SD6) have very strong values ranging from 0.908 to 0.963. These results indicate that all indicators are suitable for use in measuring constructs and support the validity of the measurements in this research model.

Table 2. Outer loading values

	Environmental Awareness	Environmental Knowledge_	Perception of Government Environmental Policy	Personal Norms	Pro-environmental Behavior	Sustainable Development
EA1	**0,835**					
EA2	**0,822**					
EA3	**0,820**					
EK2		**0,907**				
EK3		**0,891**				
PEB 1					**0,895**	
PEB 2					**0,908**	
PEB 3					**0,768**	
PGE 3			**1,000**			
PN3				**1,000**		
SD4						**0,963**
SD5						**0,938**
SD6						**0,908**

Table 3. Direct effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Environmental Awareness -> Pro-environmental Behavior	-0,354	-0,331	0,141	2,517	**0,012**
Environmental Knowledge_ -> Pro-environmental Behavior	0,113	0,065	0,156	0,726	**0,468**
Perception of Government Environmental Policy -> Pro-environmental Behavior	0,655	0,659	0,109	6,004	**0,000**
Personal Norms -> Pro-environmental Behavior	0,249	0,240	0,079	3,134	**0,002**
Pro-environmental Behavior -> Sustainable Development	0,193	0,203	0,115	1,673	**0,095**

Based on the results of the path analysis in this study, it was found that not all independent variables have a significant influence on pro-environmental behavior or sustainable development. Three variables, namely perceptions of government environmental policies, personal norms, and environmental

awareness, show a significant influence on pro-environmental behavior. Meanwhile, environmental knowledge does not have a significant effect, and pro-environmental behavior itself does not show a direct significant effect on sustainable development.

Table 4. Indirect effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Environmental Awareness -> Pro-environmental Behavior -> Sustainable Development	-0,068	-0,066	0,049	1,404	**0,161**
Environmental Knowledge_ -> Pro-environmental Behavior -> Sustainable Development	0,022	0,014	0,038	0,578	**0,564**
Perception of Government Environmental Policy -> Pro-environmental Behavior -> Sustainable Development	0,126	0,135	0,081	1,554	**0,121**
Personal Norms -> Pro-environmental Behavior -> Sustainable Development	0,048	0,051	0,035	1,380	**0,168**

Based on the results of the mediation path analysis, it was found that all mediation paths from Environmental Awareness, Environmental Knowledge, Perception of Government Environmental Policy, and Personal Norms to Sustainable Development through Pro-environmental Behavior did not show a statistically significant relationship, with a p value above 0.05. This indicates that Pro-environmental Behavior is not able to significantly mediate the influence of the four variables on sustainable development in the context of this study. However, the path from Perception of Government Environmental Policy shows the highest coefficient value compared to other paths, so it can be a special concern to be explored further in developing policies and strategies to improve pro-environmental behavior in the future.

Environmental Awareness -> Pro-environmental Behavior

The results show that environmental awareness has a negative and significant effect on pro-environmental behavior ($p = 0.012$). This is an interesting and unusual finding, as awareness should theoretically increase environmentally friendly behavior. This result may indicate a gap between awareness and action, or it may be due to a lack of confidence in the effectiveness of individual actions in influencing issues more broadly.

Environmental Knowledge -> Pro-environmental Behavior

The relationship between environmental knowledge and pro-environmental behavior is not significant ($p = 0.468$). This shows that having knowledge about environmental issues does not necessarily encourage someone to behave in an environmentally friendly manner. It is necessary to strengthen the motivational aspect or personal value encouragement so that knowledge can be translated into real action.

Perception of Government Environmental Policy -> Pro-environmental Behavior

This variable shows a very significant positive influence ($p = 0.000$). This means that the more positive the public's perception of environmental policies taken by the government, the greater their tendency to behave pro-environmentally. This emphasizes the importance of legitimacy and trust in public policies in encouraging active public participation.

Personal Norms -> Pro-environmental Behavior

Personal norms have a positive and significant effect on pro-environmental behavior ($p = 0.002$). This shows that individual beliefs and values about the importance of protecting the environment are one of

the key factors in encouraging environmentally friendly actions. This norm acts as a moral or ethical foundation in everyday behavior.

Pro-environmental Behavior -> Sustainable Development

The results show that pro-environmental behavior does not significantly affect sustainable development (p = 0.095), although the direction of the influence is positive. This may be due to indirect influences that have not been explored, or other external factors that are more dominant in supporting the achievement of sustainable development such as macro policies, green infrastructure investment, and collective participation.

Relationship Between Environmental Awareness and Pro-environmental Behavior to Sustainable Development

The relationship between Environmental Awareness and Pro-environmental Behavior towards Sustainable Development shows a negative relationship direction with a coefficient of -0.068 and a p value of 0.161, which means it is not significant. These results indicate that although individuals have environmental awareness, it does not necessarily translate into real behavior that contributes to sustainable development. This could be caused by behavioral barriers, value inconsistencies, or lack of structural support in actualizing awareness into action.

Relationship Between Environmental Knowledge to Sustainable Development through Pro-environmental Behavior

The relationship between Environmental Knowledge and Sustainable Development through Pro-environmental Behavior, obtained a very small coefficient of 0.022 and a p value of 0.564, which indicates a very weak and insignificant relationship. This means that the environmental knowledge possessed by individuals is not enough to encourage the formation of pro-environmental behavior that has a real impact on sustainable development. This can be caused by the ineffectiveness of information delivery or the lack of individual capacity to translate knowledge into action.

Relationship Between Perception of Government Environmental Policy to Sustainable Development through Pro-environmental Behavior

The relationship between Perception of Government Environmental Policy to Sustainable Development through Pro-environmental Behavior shows a positive coefficient of 0.126 with a p-value of 0.121. Although not significant, this result shows a relatively greater potential influence compared to other variables. This indicates that public perception of government environmental policies has the potential to influence their behavior, but it is still necessary to strengthen policy implementation and increase public participation so that the influence can be significant.

Relationship Between Personal NormsI to Sustainable Development Through Pro-environmental Behavior

The relationship between Personal Norms and Sustainable Development through Pro-environmental Behavior produces a coefficient of 0.048 and a p-value of 0.168, which also means it is not significant. This shows that personal norms or internal values that a person has regarding the moral obligation to protect the environment are not strong enough to encourage real behavior that supports sustainability. An approach that touches more on the affective and motivational aspects of the individual is needed so that this norm can be realized in the form of consistent and impactful pro-environmental behavior.

Based on the survey results described above, environmental management based on sustainable development through pro-environmental behavior in Medan City requires active involvement from the community and support from the government and private sector. With a holistic approach, increasing pro-environmental knowledge, attitudes, and actions will help achieve sustainable development goals and maintain environmental health for future generations. Collaborative efforts, ongoing education, and environmentally beneficial policies are essential to realizing sustainable change. These efforts are also based on the basic principles of environmental management put forward by (Chigbu, 2024; Simina Lakatos et al., 2023), as follows:

1. Interdependence

There is a strong relationship between the environment, society, and economy. Policies that do not take these three aspects into account can lead to environmental degradation and social injustice.

2. Community Participation

Involving communities in decision-making and implementation of environmental programs is essential to achieving collective commitment.

3. Knowledge-Based

Educating and raising public awareness of environmental issues is essential so that they can take appropriate action.

Then, pro-environmental behavior is also adjusted to the concept put forward by (German et al., 2022; Prasetyo et al., 2024), namely

1. Level of Knowledge

Public knowledge about various environmental issues, such as pollution, waste management, and the impacts of climate change, is the basis for forming pro-environmental behavior. A more educated society tends to be more aware of the importance of protecting the environment.

2. Attitude Towards the Environment

Positive public attitudes towards the environment, formed through formal and informal education, can encourage pro-environmental actions. For example, environmental campaigns can increase public awareness.

3. Pro-Environmental Actions

Real actions that reflect pro-environmental behavior such as reducing plastic use, participating in clean-up events, and good waste management are indicators of successful environmental management.

Thus, the results of this study were also analyzed using SWOT analysis to produce several strategies that can be used as solutions in realizing sustainable development through pro-environmental behavior of human resources which are used as strategies in environmental management.

Table 5. SWOT Analysis Matrix

Internal	**Strenghts** **1. Increased Awareness** The public is beginning to have a better understanding of environmental issues thanks to educational programs conducted by the government and non-governmental organizations. This knowledge includes the importance of sustainability and the impact of individual behavior on the environment. **2. Positive Attitudes Towards the Environment** There is a growing awareness of the importance of preserving the environment, which encourages people to participate in pro-environmental activities such as creating city parks and cleaning up the environment. **3. Community Involvement** Many organizations and communities are active in Medan that encourage pro-environmental behavior, creating collaborations between the community and	**Weakness** 1. **Lack of Supporting Infrastructure** Even though knowledge and awareness exist, often the lack of adequate infrastructure, such as separate waste bins and recycling facilities, hinders people's pro-environmental behavior. **2. Policy Instability** Environmental policies that are inconsistent or poorly implemented can reduce public trust in the effectiveness of environmental efforts. **3. Economic Factors** Some people still focus on short-term economic needs, which often ignore environmental interests. This can reduce individual motivation to participate in sustainable practices.

Eksternal	institutions for environmental conservation programs.	
Opportunity **1. Development of Education Programs** The opportunity to conduct more intensive education programs and campaigns on the importance of sustainability, both in schools and in the general public, is very open. **2. Government Policy Initiatives** The government can strengthen and align policies that support environmental conservation, such as incentives for communities that implement environmentally friendly practices. **3. Private Sector Participation** Companies can play an active role in supporting research and development of environmentally friendly technologies and encourage employees to behave pro-environmentally in the workplace.	**Alternative Strategy (SO)** 1. Development of environmental education and outreach programs 2. Strengthening sustainable environmental policies 3. Development of environmental support infrastructure 4. Collaboration with the private sector in environmental programs 5. Integrated environmental campaigns	**Alternative Strategy (WO)** 1. Improving the quality of environmental education 2. Continuous awareness campaigns and outreach 3. Community-based community development 4. Lobbying the government for better environmental policies 5. Provision of environmentally friendly facilities
Treaths **1. Environmental Pollution** High levels of urbanization and industrialization can lead to increased pollution, which has negative impacts on public health and biodiversity. 2. **Climate Change** Global problems such as climate change present complex challenges for environmental management,	**Alternative Strategy (ST)** 1. Strengthening collaborative networks between stakeholders 2. Data-based outreach on environmental impacts 3. Strict environmental law enforcement 4. Carbon and renewable energy action programs 5. Development of green infrastructure and open spaces	**Alternative Strategy (WT)** 1. Developing effective environmental education and awareness programs 2. Provision of adequate waste management facilities 3. Enforcement of encrypted environmental policies 4. Massive outreach on the impacts of climate change and pollution 5. Development of an integrated action plan

threatening natural resources and disrupting the balance of ecosystems. 3. **Public Indifference** Despite knowledge and awareness, the indifference of some people can be a threat, especially if they do not see direct results from pro-environmental actions.		

Through SWOT analysis, it can be concluded that environmental management based on sustainable development in Medan City has strengths that can be utilized to advance pro-environmental behavior. However, serious attention needs to be paid to the existing weaknesses and threats. By optimizing opportunities, especially in the fields of education and government policies, as well as collaborating with the private sector, it is hoped that it can create sustainable positive changes in environmental management and build pro-environmental awareness among the community. The proposed SO strategy aims to utilize the strengths possessed by the Medan City community and the opportunities available in environmental management based on sustainable development. As stated by (B.Sh, Usmonov; Z.A, Babakhanova; Kh.L, 2019; Koupatsiaris & Drinia, 2024) through improving education, strengthening policies, infrastructure development, collaboration with the private sector, and integrated campaigns, it is hoped that a stronger and more sustainable pro-environmental culture can be created. This not only improves environmental quality, but also produces positive changes for society as a whole. Meanwhile, the proposed WO strategy aims to take advantage of existing opportunities in the context of environmental management in Medan City, while addressing identified weaknesses. As research from (Paramati et al., 2017; Tuanaya, 2024) by improving the quality of environmental education, launching awareness campaigns, developing community-based communities, lobbying for better policies, and providing environmentally friendly facilities, it is expected to create an ecosystem that supports pro-environmental behavior. Through these steps, Medan City can move towards more effective and sustainable sustainable development. Then, the proposed ST Strategy aims to utilize the strengths that exist in the Medan City community to deal with various threats to the environment. By strengthening collaborative networks, data-based counseling, strict law enforcement, renewable energy programs, and green infrastructure development, it is expected to create a healthier and more sustainable environment. Thus, as stated by (B.Sh Babakhanova; Kh.L, Pulatov, 2019) that these strategies will not only reduce existing threats, but also strengthen the role of the community in sustainable environmental management. Furthermore, the proposed WT Strategy aims to address existing weaknesses while protecting itself from existing threats to environmental management in Medan City. By developing effective education programs, providing adequate waste management facilities, enforcing strict policies, educating the public about environmental impacts, and formulating integrated action plans, it is expected to create a more sustainable and healthy environment. These steps will help raise public awareness and strengthen their role in maintaining environmental sustainability.

Thus, the results of the SWOT analysis show that Medan City is at a critical point in environmental management based on sustainable development. Existing strengths need to be utilized to address weaknesses and threats, while optimizing available opportunities. Collaborative efforts involving all parties from government, society, and the private sector are needed to formulate and implement effective strategies. With an integrated and results-oriented approach, it is hoped that Medan City can improve its environmental conditions, create better living spaces, and realize sustainable development that benefits the entire community. The right steps taken now will determine the welfare of future generations, so strategies can be offered in environmental management in Medan City through pro-environmental behavior, namely

1. Education and outreach, namely organizing educational programs to increase public knowledge and awareness regarding the importance of environmental conservation.
2. Environmentally friendly facilities, namely building supporting infrastructure such as separate waste collection points and recycling centers.
3. Environmental campaigns, namely holding campaigns to encourage the community to engage in environmentally friendly practices, such as reducing plastic use and increasing tree planting.
4. Policies and regulations, namely establishing policies that support environmental management, as well as providing incentives for individuals and companies that implement sustainable practices.

CONCLUSION

Environmental management based on sustainable development in Medan City is a must in the context of the rapid growth faced by the city. As described in the analysis, the presence of strengths in the form of increasing levels of community environmental knowledge and awareness is a valuable asset. Medan society shows active involvement as reflected in participation in environmental programs. However, there are weaknesses in terms of adequate infrastructure and consistent implementation of environmental policies, which have the potential to hinder pro-environmental efforts. The threats faced, such as worsening pollution and the impacts of climate change, increase the urgency of collective action. With the opportunity to strengthen environmental management through education, collaboration with the private sector, and better implementation of government policies, it needs to be used as a momentum to create significant change. The use of collaborative models in responding to environmental challenges is an effective strategy to bridge existing strengths and opportunities. Effective environmental education not only enriches community knowledge, but also serves as a tool to build collective awareness of the importance of maintaining ecosystems. Given the weaknesses in the environmental education system in Medan City, improving education and awareness programs is an important step that needs to be taken. Education must not only be integrated into the school curriculum, but must also be extended to the general public so that the community has a better understanding of environmental issues. Educational campaigns involving various elements of society, from children to adults, must be carried out with an attractive approach. Through effective delivery, the public can understand the importance of their role in protecting the environment and the impact of individual actions on sustainability. Weaknesses in existing infrastructure require serious attention. Various facilities such as separate waste disposal sites, recycling centers, and greening locations must be repaired and expanded. Providing adequate infrastructure will create space for the community to act in accordance with the knowledge and awareness they have acquired. Multi-stakeholder cooperation, including the government and the private sector, is needed to build and maintain environmentally friendly infrastructure. Government agencies must commit to allocating sufficient budgets to support this initiative, while private actors can play a role in investing in and managing these facilities. One of the keys to successful environmental management in Medan City is the active involvement of all parties: government, community, private sector, and academics. Strong synergy is needed between these parties to formulate effective policies and implement them in practice. The socialization carried out by the government regarding environmental policies must be clear and easy to understand, so that the community can actively participate in the process.

In addition, increasing community participation in environmental monitoring is also important. The formation of community groups that care about the environment can have a positive impact on monitoring and implementing environmental policies. Innovative programs based on environmentally friendly technology are needed to reduce the negative impacts caused by rapid urbanization. Strengthening community capacity in dealing with climate change is also an important aspect. Communities need to be empowered through training and workshops that provide practical knowledge to help them adapt and contribute to reducing the impacts of climate change. Based on the results of the analysis and discussion, several strategic recommendations can be suggested for environmental management based on sustainable development in Medan City, namely integrating environmental education into the curriculum at all levels of education, implementing an attractive and descriptive environmental awareness campaign for all groups, improving waste management and recycling facilities by involving third parties in management, formulating clear and measurable policies and implementing socialization among the community, building a collaborative network between the government, community, and the private sector for better synergy, providing training to the community to increase

their capacity in dealing with climate change. In the context of environmental management based on sustainable development, Medan City has great potential if all strengths, weaknesses, opportunities, and threats can be recognized and managed properly. Through strengthening education, infrastructure, policies, and community participation, it is hoped that environmental management in this city can run more effectively. With the courage to innovate, collaborate, and be open to input from all stakeholders, a more sustainable future for Medan City can be achieved, providing benefits not only for the current generation but also for future generations. This effort is not only the responsibility of the government, but also a shared responsibility of all elements of society to create a healthy, safe, and sustainable living environment.

REFERENCE

1. Ahmad, J., Al Mamun, A., Masukujjaman, M., Mohamed Makhbul, Z. K., & Mohd Ali, K. A. (2023). Modeling the workplace pro-environmental behavior through green human resource management and organizational culture: Evidence from an emerging economy. Heliyon, 9(9), e19134. https://doi.org/10.1016/j.heliyon.2023.e19134
2. Al-Sabi, S. M., Al-Ababneh, M. M., Al Qsssem, A. H., Afaneh, J. A. A., & Elshaer, I. A. (2024). Green human resource management practices and environmental performance: the mediating role of job satisfaction and pro-environmental behavior. Cogent Business and Management, 11(1). https://doi.org/10.1080/23311975.2024.2328316
3. Ansari, H. U. H., & Khan, S. N. (2024). Linking green transformational leadership and employee pro-environmental behavior: The role of intention and work environment. Sustainable Futures, 8(April), 100336. https://doi.org/10.1016/j.sftr.2024.100336
4. Anshima, Sharma, D., & Bhardwaj, B. (2025). Green human resource management practices and sustainable development in India: A systematic literature review and future research agenda. Social Sciences and Humanities Open, 11(February), 101420. https://doi.org/10.1016/j.ssaho.2025.101420
5. B.Sh, Usmonov; Z.A, Babakhanova; Kh.L, P. (2019). Green Chemistry and Sustainable Development: Tashkent Institute of Chemical Technology Acts Responsibly. Sustainability (Switzerland), 11(1), 1–14. http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng-8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_SISTEM_PEMBETUNGAN_TERPUSAT_STRATEGI_MELESTARI
6. B.Sh Babakhanova; Kh.L, Pulatov, U. Z. A. (2019). Green Chemistry and Sustainable Development: Tashkent Institute of Chemical Technology Acts Responsibly. Sustainability (Switzerland), 11(1), 1–14. http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng-8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_SISTEM_PEMBETUNGAN_TERPUSAT_STRATEGI_MELESTARI
7. Beisheim, M., Ellersiek, A., Goltermann, L., & Kiamba, P. (2018). Meta-Governance of Partnerships for Sustainable Development: Actors' Perspectives from Kenya. Public Administration and Development, 38(3), 105–119. https://doi.org/10.1002/pad.1810
8. Bortnyk, S., Lavruk, T., & Peresadko, V. (2024). Strategic Spatial Planning of Territorial Communities to achieve the Sustainable Development Goals. Visnyk of V. N. Karazin Kharkiv National University, Series "Geology. Geography. Ecology," 2024(61), 121–136. https://doi.org/10.26565/2410-7360-2024-61-10
9. Buzinske, J. (2024). Green Finance Model For The Sustainable Development of Zero-Waste Cities (Issue S 004) [Vilnius Gediminas Technical University]. https://doi.org/https://doi.org/10.20334/2024-047-M
10. Chigbu, B. I. (2024). Advancing sustainable development through circular economy and skill development in EV lithium-ion battery recycling: a comprehensive review. Frontiers in Sustainability, 5(June), 1–16. https://doi.org/10.3389/frsus.2024.1409498
11. Creswell, J. W. (2014). Research Design (Qualitative, Quantitative, and Mixed Methods Approaches). In Research Design Third Edition. Sage Publications.
12. Esponda Perez, J. A., Galindo, S. M., Farooq, M., Ejaz, S., Ahmed, S., & Ejaz, F. (2024). Examining pro-environmental behavior through green human resource management and green innovation moderating role of environmental strategy. Asia Pacific Management Review, 30(1), 100345. https://doi.org/10.1016/j.apmrv.2024.100345
13. Fadhlinsyah, Siti Hajar, & Obed Bida. (2023). Spatial Policy on Environmental Management in Gayo Lues Regency. International Journal of Health, Economics, and Social Sciences (IJHESS), 5(3), 192–203. https://doi.org/10.56338/ijhess.v5i3.3777
14. Ganea, H. V. (2020). European Circular Economy - A Real Model For The Sustainable Development of The Economy of The Republic of Moldova. European Journal of Accounting, Finance & Business, XIV(October), 1–7.
15. German, J. D., Redi, A. A. N. P., Prasetyo, Y. T., Persada, S. F., Ong, A. K. S., Young, M. N., & Nadlifatin, R. (2022). Choosing a package carrier during COVID-19 pandemic: An integration of pro-environmental planned behavior (PEPB) theory and service quality (SERVQUAL). Journal of Cleaner Production, 346(February), 131123. https://doi.org/10.1016/j.jclepro.2022.131123
16. Gonzalez-Urango, H., & García-Melón, M. (2018). Stakeholder engagement to evaluate tourist development plans with a sustainable approach. Sustainable Development, 26(6), 800–811. https://doi.org/10.1002/sd.1849
17. Gorard, S. (2018). Quantitative Methods in Social Science. In Continum (First). Continuum International Publishing Group.
18. Gu, Y., Xia, Z., Tian, X., Xie, J., & Liu, Y. (2024). Factors determining reuse behavior: A meta-analysis. Cleaner and Responsible Consumption, 14(May), 100213. https://doi.org/10.1016/j.clrc.2024.100213

19. Hajar, S., Ramlan, & Saputra, A. (2024). Environmental governance in the development of tourist village based local wisdom. E3S Web of Conferences, 506, 1–10. https://doi.org/10.1051/e3sconf/202450606008
20. Iftikar, T., Hussain, S., Malik, M. I., Hyder, S., Kaleem, M., & Saqib, A. (2022). Green human resource management and pro-environmental behaviour nexus with the lens of AMO theory. Cogent Business and Management, 9(1). https://doi.org/10.1080/23311975.2022.2124603
21. Joesidawati, M. I., & Suwarsih, S. (2022). Measurement of Indonesian Marine Health Index to Assess the Health of the Coastal Ecosystem of Tuban, East Java. IOP Conference Series: Earth and Environmental Science, 1036(1). https://doi.org/10.1088/1755-1315/1036/1/012046
22. Joshi, A., Kale, S., Chandel, S., & Pal, D. (2015). Likert Scale: Explored and Explained. British Journal of Applied Science & Technology, 7(4), 396–403. https://doi.org/10.9734/bjast/2015/14975
23. Koupatsiaris, A. A., & Drinia, H. (2024). Investigating Sense of Place and Geoethical Awareness among Educators at the 4th Summer School of Sitia UNESCO Global Geopark: A Quasi-Experimental Study. Geosciences (Switzerland), 14(10). https://doi.org/10.3390/geosciences14100269
24. Kultar Singh. (2007). Quantitative Social Research Methods (First). Sage Publications. http://library1.nida.ac.th/termpaper6/sd/2554/19755.pdf
25. Kurniawan, T. A., Dzarfan Othman, M. H., Hwang, G. H., & Gikas, P. (2022). Unlocking digital technologies for waste recycling in Industry 4.0 era: A transformation towards a digitalization-based circular economy in Indonesia. Journal of Cleaner Production, 357(April), 131911. https://doi.org/10.1016/j.jclepro.2022.131911
26. Larik, J., & Singh, A. (2017). Sustainability in Oceans Governance: Small Islands, Emerging Powers, and Connecting Regions. Global Policy, 8(2), 213–215. https://doi.org/10.1111/1758-5899.12443
27. Lian, T., & Li, C. (2024). Linking Environmental Sustainability and Financial Resilience through the Environmental Footprints and Their Determinants: A Panel Data Approach for G7 Countries. Sustainability, 16(17), 7746. https://doi.org/10.3390/su16177746
28. Mahruf, F. N. A., Boer, K. M., Sucipta, J. A. W., & Agustian, J. F. (2024). Representation of Environmental Issues in Marjan's "Baruna the Guardian of the Ocean" Ad 2023 Episode 1 and 2 (Analysis Semiotika Charles Sanders Peirce). Jurnal Indonesia Sosial Sains, 5(04), 667–686. https://doi.org/10.59141/jiss.v5i04.1058
29. Mamun, A. Al, Uddin, M. A., Rana, T., Biswas, S. R., & Dey, M. (2024). Socially responsible human resource management for sustainable performance in a moderated mediation mechanism. Sustainable Futures, 8(April), 100362. https://doi.org/10.1016/j.sftr.2024.100362
30. Montalvo-Falcón, J. V., Sánchez-García, E., Marco-Lajara, B., & Martínez-Falcó, J. (2023). Green human resource management and economic, social and environmental performance: Evidence from the Spanish wine industry. Heliyon, 9(10). https://doi.org/10.1016/j.heliyon.2023.e20826
31. Paramati, S. R., Shahbaz, M., & Alam, M. S. (2017). Does tourism degrade environmental quality? A comparative study of Eastern and Western European Union. Transportation Research Part D: Transport and Environment, 50, 1–13. https://doi.org/10.1016/j.trd.2016.10.034
32. Prasetyo, Y. T., Kurata, Y. B., Zahra, K., Cahigas, M. M. L., Nadlifatin, R., & Gumasing, M. J. J. (2024). Factors affecting compliance with vehicular environmental laws and pro-environmental behavior in Lahore, Pakistan. Acta Psychologica, 251(August), 104614. https://doi.org/10.1016/j.actpsy.2024.104614
33. Raman, R., Das, P., Mandal, S., Vijayan, V., AR, A., & Nedungadi, P. (2024). The impact of Gen Z's pro-environmental behavior on sustainable development goals through tree planting. Sustainable Futures, 8(June), 100251. https://doi.org/10.1016/j.sftr.2024.100251
34. Sampene, A. K., Li, C., & Esther Agyeiwaa, O. (2024). Green human resource to stimulate low carbon behaviour through the mediation role of innovation practices and organizational commitment. International Journal of Innovation Studies, 8(4), 364–380. https://doi.org/10.1016/j.ijis.2024.09.001
35. Sánchez-García, E., Martínez-Falcó, J., Marco-Lajara, B., & Zakimova, A. (2025). Achieving environmentally responsible production through green managerial awareness, human resource management and employee behavior. Journal of Environmental Management, 373(August 2024). https://doi.org/10.1016/j.jenvman.2024.123739
36. Schwann, A. (2018). Ecological wisdom: Reclaiming the cultural landscape of the Okanagan Valley. Journal of Urban Management, 7(3), 172–180. https://doi.org/10.1016/j.jum.2018.05.004
37. Sharma, A., Kumar, K., & Dwesar, R. (2025). "Keenly aware of environmental issues, yet wavering in conviction": Understanding the factors influencing the consumers' willingness to pay for green energy. Sustainable Futures, 9(October 2024), 100427. https://doi.org/10.1016/j.sftr.2024.100427
38. Simina Lakatos, E., Dan Clinci, S., Koval, V., & Daniel Lakatos, G. (2023). Creating Livable Cities Through Sustainable Built Environments in the Circular Economy. Innovative Economics and Management, 10(2), 260–270. https://doi.org/10.46361/2449-2604.10.2.2023.260-270
39. Surata, S. P. K., & Vipriyanti, N. U. (2018). The subak cultural landscape as environmental education: Knowledge, attitudes, and experiences of Balinese teachers, student teachers, and students. Journal of Environmental Education, 49(1), 59–70. https://doi.org/10.1080/00958964.2017.1406890
40. Tuanaya, W. (2024). Building Eco-Friendly Cities: Government-Community Collaboration In Shaping Sustainable Urban Waste Management. Baileo: Jurnal Sosial Humaniora, 1(3), 281–292. https://doi.org/10.30598/baileofisipvol1iss3pp281-292
41. Tuthaes, L. C., Toda, H., & Lake, P. (2024). Hexa Helix's Collaboration in Creative Economy Development Based on Local Wisdom: Case Study of Ikat Weaving MSMEs in Kupang City. Jurnal Bina Praja, 16(1), 171–185. https://doi.org/10.21787/jbp.16.2024.171-185
42. Ulupui, I. G. K. A., Zairin, G. M., Musyaffi, A. M., & Sutanti, F. D. (2024). Navigating uncertainties: a tri-factorial evaluation of risk management adoption in MSMEs. Cogent Business and Management, 11(1). https://doi.org/10.1080/23311975.2024.2311161

43. Valdivieso, J. C. (2019). Stakeholders' motivation to adopt corporate social responsibility practices in the lodging industry in an island destination: Balearic Islands case study. International Journal of Tourism Policy, 9(2), 79–98. https://doi.org/10.1504/IJTP.2019.102623
44. Yasril, Y., & Nur, A. (2018). Partisipasi Masyarakat Dalam Pemberdayaan Lingkungan. Jurnal Dakwah Risalah, 28(1), 1. https://doi.org/10.24014/jdr.v28i1.5538
45. Yeremeyev, I., Dychko, A., Remez, N., Kraychuk, S., & Ostapchuk, N. (2021). Problems of sustainable development of ecosystems. IOP Conference Series: Earth and Environmental Science, 628(1). https://doi.org/10.1088/1755-1315/628/1/012014
46. Zhu, L., Wang, C., Huang, N., Fu, Y., & Yan, Z. (2022). Developing an Indicator System to Monitor City's Sustainability Integrated Local Governance: A Case Study in Zhangjiakou. Sustainability (Switzerland), 14(9). https://doi.org/10.3390/su14095047
47. Zhuang, A., Stoffelen, A., Meijles, E., & Groote, P. (2024). The complex governance of protected areas: Insights from geoheritage and geopark management in China. Environmental Policy and Governance, May, 679–690. https://doi.org/10.1002/eet.2118