

Environmental Sanitation Handling Strategy in Slum Area in Palu City, Indonesia

Miswan, Gufran D. Dirawan, Bakhrani A. Rauf, Lahming, Budiman, Hamidah, Ahmad Yani

Abstract: *The problem of environmental sanitation is one of the 17 objectives of the Sustainable Development Goals (SDGs). The handling of environmental sanitation by the government so far has faced many obstacles. Likewise, with the Province of Central Sulawesi, only ranked 26th with regard to access to sustainable sanitation in Indonesia. Based on this, the problem formulation is: How is the description of environmental knowledge, environmental sanitation knowledge, income levels, attitudes, behavior and how is the influence of environmental knowledge on behavior, the effect of environmental sanitation knowledge on community behavior and the influence of income level on attitudes, and the Sanitation Handling Strategy Slum Areas? This type of research is a quantitative method survey research. With the aim of testing the hypothesis. The population is the whole family head of 22,130 families. Determination of the sample is done by the Proposional Stratified Sampling method. The results obtained, namely: Environmental knowledge influences the attitude in managing the environment by 0.68 with a probability value (P) 0.00001. Environmental knowledge has no effect on people's behavior in handling environmental sanitation by 0.221 with a probability value (P) 0.055. Knowledge of environmental sanitation affects the attitude in managing the environment by 0.349 with a probability value (P) 0.021. Knowledge of environmental sanitation has no effect on people's behavior in handling environmental sanitation by 0.261 with a probability value (P) 0.00001. Income level influences the attitude in managing the environment by -0.112 with a probability value (P) 0.087. The level of income affects the behavior of the community in handling environmental sanitation by -0.161 with a probability value (P) 0.003. The attitude in managing the environment influences community behavior in handling environmental sanitation by 0.548 with a probability value (P) 0.00001. It is expected that the government, community leaders, religious leaders, and all stakeholders are involved in handling environmental sanitation.*

Keywords: *Environmental sanitation, Slum area, Strategy Handling*

Revised Manuscript Received on October 05, 2019.

* Correspondence Author

Miswan*, Postgraduate Doctoral Program Students Universitas Negeri Makassar & Department of Biology, Tadulako University, Indonesia.

Gufran, D Dirawan, Department of Civil Engineering, Universitas Negeri Makassar, Indonesia

Bakhrani A. Rauf, Department of Civil Engineering, Universitas Negeri Makassar, Indonesia

Lahming, Department of Agricultural Technology Education, Universitas Negeri Makassar, Indonesia

Budiman, Faculty of Public Health Universitas Muhammadiyah Palu, Indonesia

Hamida, Faculty of Public Health Universitas Muhammadiyah Palu, Indonesia

Ahmad Yani, Faculty of Public Health Universitas Muhammadiyah Palu, Indonesia

I. INTRODUCTION

Sanitation as one aspect of development has an important function in supporting the level of community welfare because it is related to health, lifestyle, environmental conditions of settlements, aesthetics and comfort in daily life. Sanitation is one of the most important factors in realizing services related to poverty alleviation and increasing productivity. However, it is still often found that aspects of sanitation development, which include wastewater, solid waste and drainage, including the provision of hygienic water and Clean and Healthy Living Behavior, are however operating independently. Even though it is included in one area of development, namely sanitation, but each of these aspects is handled separately so that there are many overlapping sanitation development activities by different institutions, on the other hand, there are still many sanitation aspects that have not been handled by anyone [1].

The issue of Sanitation issues is one of the 17 goals of the Sustainable Development Goals (SDGs), one of the 17 SDGs goals relating to Sanitation is ensuring the Availability and Management of Clean Water and Sustainable Sanitation for All. To achieve the SDGs' objectives of ensuring the availability and management of water and sanitation, the target is the provision of clean water; achieve sanitary and hygienic access to proper and equitable disposal of feces for everyone; improve water quality by reducing pollution; implementing integrated water management practices protecting and restoring water-related ecosystems; and support the participation of local communities to improve water and sanitation management [2].

The handling of environmental sanitation by the government so far has faced many obstacles. The number of facilities is not proportional to population growth. In addition, people in many areas still practice unhealthy living behaviors, such as defecating in any place, washing in dirty river water, and littering[3].

Based on the description above, it is necessary to study about. The Incomplete sentence influence of the level of knowledge and attitudes towards behavior in handling environmental sanitation.

II. METHODOLOGY

This type of research is quantitative research through survey research stages. In the survey, the study was not conducted on all objects studied or population, but only took a portion of the population (sample) of the community, namely to describe the characteristics of environmental sanitation in slums in the city of Palu, Central Sulawesi Province. This research was conducted in 2018. This study was intended to answer the problems that had been formulated, and the objectives of the research to be achieved.

The research design is based on the dependent variable (Y), namely community behavior in handling environmental sanitation in slums in the city of Palu and independent variables consisting of environmental knowledge (X1), environmental sanitation knowledge (X2), and attitudes in managing the environment (X3), income level (X4). The design of this study is based on the SEM model. It is assumed that all variables are considered to have a direct or indirect relationship. The data analysis technique used is to use the Structural Equation Model (SEM) technique. Meanwhile, to realize the acceleration of environmental sanitation development in slums in Palu City, Central Sulawesi, using Strength Weakness Opportunity Threat (SWOT) analysis.

III. RESULT

Structural Equation Modeling (SEM) Analysis

Based on the results of the Structural Equation Modeling Analysis (SEM) in this study, the pattern of causal relationships between the dependent variable (Y) is behavior in handling environmental sanitation with four (4) independent variables, respectively: environmental knowledge (X1), environmental sanitation knowledge (X2), Income Level (X3), and attitude in managing the environment (X4). The concept of a causal relationship between the Y variable with the X variables themselves and the direct or indirect influence of all X variables on the Y variable is built based on the theory made in the form of diagrams so that it is obtained as shown in the following figure:

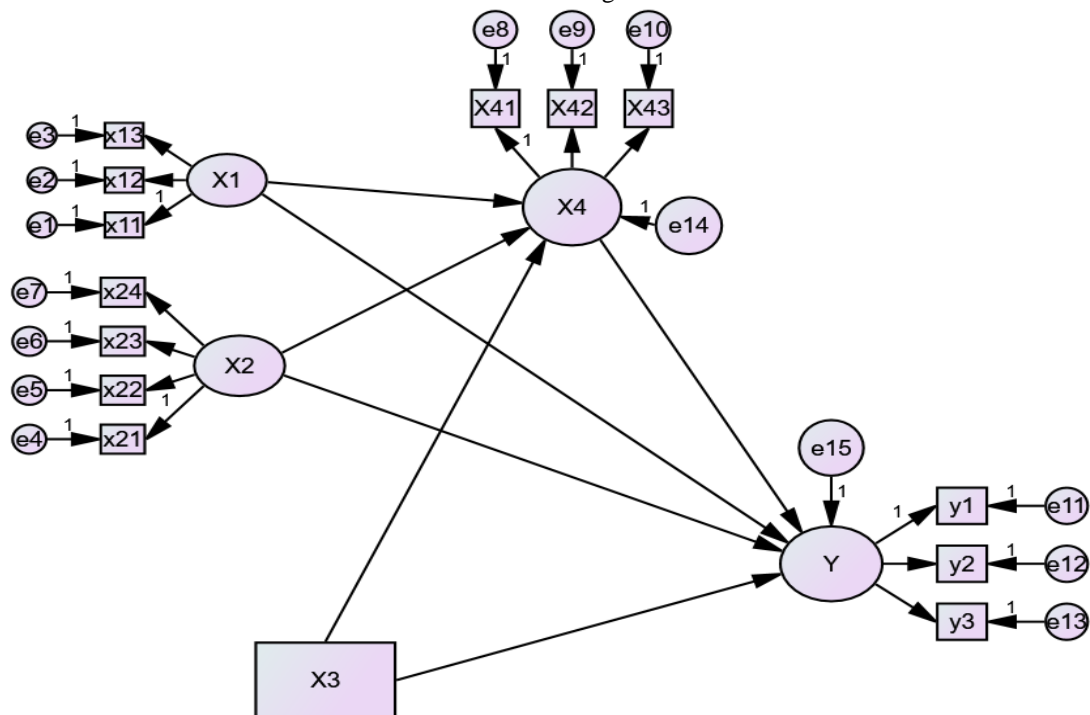


Figure 1. Input SEM Analysis Diagram

Figure 1. It shows that the environmental knowledge variable (X1) has a direct or indirect effect on the community behavior variable in handling environmental sanitation (Y). The winding effect of this variable is through the effect on attitude in managing the environment (X4). Environmental sanitation knowledge variable (X2) and Income Level (X3) have the same pattern of influence in the pattern of environmental knowledge (X1) on community behavior variables in handling environmental sanitation (Y) both directly and indirectly. The roundabout effect of these two variables X2 and X3 through the intermediate variable are the attitude in managing the environment (X4). The three variables X

namely: X1, X2, and X3 have through and winding correlations, while the attitude variable in managing the environment (X4) only has a clear influence on the community behavior variable in handling environmental sanitation (Y). The summary of SEM analysis results presented in Figures 2, and 3 includes the estimated value of the model on a table consisting of the weighted regression values, direct and indirect effects and the total effect of each variable, both standardized and indirect. The effect of each indicator of all variables can be seen in the appendix to the full results.

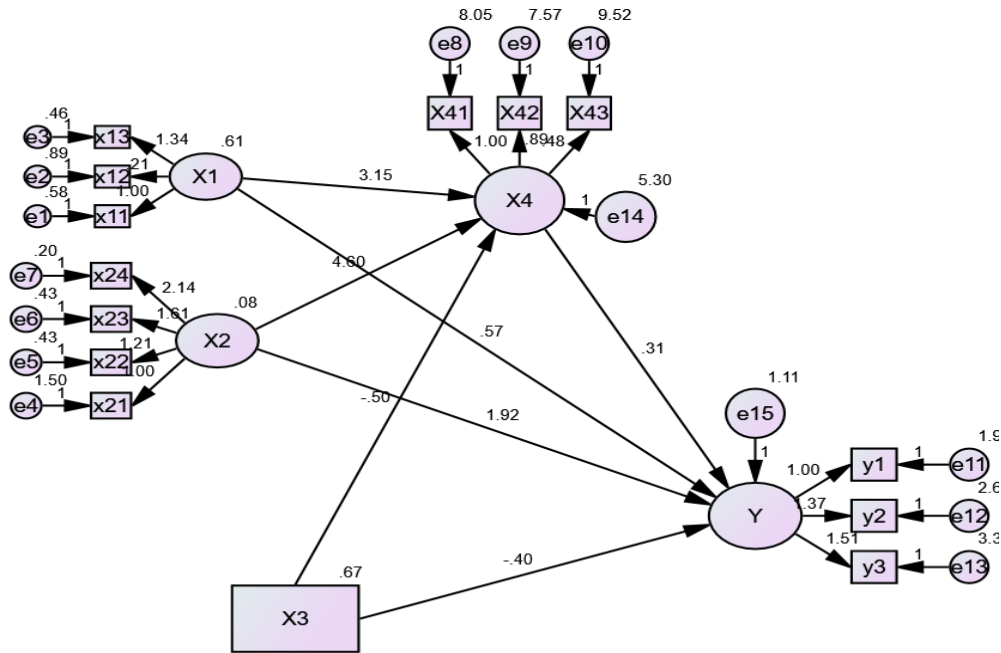


Figure 2. Output of SEM Regression Weights Analysis

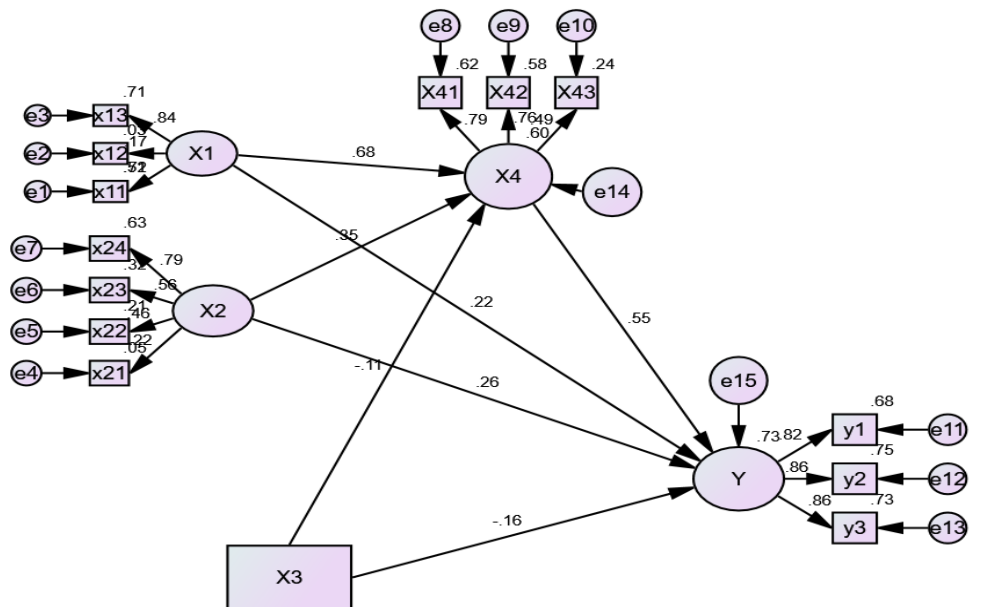


Figure 3. Output Analysis SEM (Standardized Regression Weights)

To test the hypotheses about causality developed from this model, it is necessary to test hypothesis one, which states that the regression coefficient between relationships is equal to zero through observing the values from the Regression Weights column Critical Ratio (CR) and Standardized Regression Weights on column estimate value. Significance value compared to the level (Probabilities) 0.05. If the significance value of the causal relationship is less than 0.05, then H0 is rejected and H1 is accepted.

Table 1. Regression Weights: (Group number 1 - Default model)

			S.E	C.R	P	Label
Attitude	<---	Income Level	.291	-.1711	.087	RX4X3
Attitude	<---	Environmental Influence	.449	7.020	***	RX4X1
Attitude	<---	Environmental Influence	1.990	2.311	.021	RX4X2
Behavior	<---	Attitude	.076	4.035	***	RXY4
Behavior	<---	Environmental Influence	.298	1.919	.055	RXY1
Behavior	<---	Income Level	.133	-2.993	.003	RXY3
Behavior	<---	Environmental Influence	.922	2.079	***	RXY2

Environmental Sanitation Handling Strategy in Slum Area in Palu City, Indonesia

Table 2. Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
Attitude	<---	Income Level	-.112
Attitude	<---	Environmental Influence	.680
Attitude	<---	Environmental Influence	.349
Behavior	<---	Attitude	.548
Behavior	<---	Environmental Influence	.221
Behavior	<---	Tingkat Pendapatan	-.161
Behavior	<---	Environmental Influence	.261

From the summary of SEM analysis results, the following hypotheses can be described:

The magnitude of the influence of environmental knowledge on attitudes in managing the environment amounted to 0.68 with a probability value (P) 0.00001 stated that the H1 Hypothesis was accepted.

The magnitude of the influence of environmental knowledge on community behavior in handling environmental sanitation by 0.221 with a probability value (P) 0.055 stated that the H0 Hypothesis was accepted.

The magnitude of the influence of environmental knowledge on attitudes in managing the environment amounted to 0.349 with a probability value (P) 0.021 stated that the H1 Hypothesis was accepted.

The magnitude of the influence of environmental sanitation knowledge on community behavior in handling environmental sanitation by 0.261 with a probability value (P) 0.00001 stated that the H1 Hypothesis was accepted.

The magnitude of the influence of the level of income on the attitude in managing the environment amounted to -0.112 with a probability value (P) 0.087 stated that the H1 Hypothesis was rejected.

The magnitude of the influence of the level of income on people's behavior in handling environmental sanitation is -0.161 with a probability value (P) 0.003 stated that the H1 Hypothesis is accepted.

The magnitude of the influence of attitudes in managing the environment on community behavior in handling environmental sanitation by 0.548 with a probability value (P) 0.00001 stated that the H1 Hypothesis was accepted.

Some direct, indirect and total effects can be summarized as in the following table:

Table 3. Large Direct Effects, Indirect Effects and Total Influence of environmental knowledge (X1), Sanitation knowledge (X2), Income Level (X3), Attitudes in managing the environment (X4) and Community Behavior in environmental sanitation (Y)

Influence of Variables	Causal Influence		Total Influence
	Live	Through X4	
X1 to X4	0,68	-	0,68
X2 to X4	0,349	-	0,349
X3 to X4	-0,112	-	-0,112

X1 to Y	0,221	0,548	0,769
X2 To Y	0,261	0,548	0,809
X3 to Y	-0,161	0,548	0,387

Strength Weakness Opportunity Threat (SWOT) Analysis

Based on the results from the determination of priority handling areas, plans for handling environmental sanitation for three sectors are compiled, namely wastewater, solid waste and drainage. The strategy for handling environmental sanitation is based upon the level of city needs to support activities that have been carried out previously so that it is expected that there will be sustainability of programs and activities in accelerating the handling of environmental sanitation [4], [5]. To realize the acceleration of handling environmental sanitation that supports the city vision, strategies for handling sanitation are needed.

The strategy was prepared using Strength Weakness Opportunity Threat (SWOT) analysis according to the SWOT analysis matrix. The strategy includes not only technical aspects but also non-technical aspects (institutional, funding, communication, community participation and the business world as well as aspects of gender equality and alignments with the poor). To conduct this analysis based on the strategic issues of each sector collected, it is divided into two groups, namely external and internal factors. External factors are derived from outside in the form of opportunities (threats) and threats (threats), while internal factors are obtained from within which are strengths and weaknesses.

Domestic wastewater

The strategy for handling environmental sanitation (domestic wastewater) in the city of Palu is focused on gradually starting the handling of the offsite system Waste Management infrastructure, especially in areas that have priority development of this system. The recommended offsite system infrastructure based on planning instruments is the WWTP. The handling of onsite infrastructure is still carried out in low density areas through the development of the Sanimas system, communal septicktank and MCK ++. In these systems, community participation must be greater considering the operation and maintenance will later be carried out by the community itself. To achieve the goals and mission of sanitation, there are five strategies in planning wastewater treatment. The strategy is:

Table 4. Domestic Wastewater Treatment Strategies

Component		Strategy
Domestic wastewater	1	increases public awareness of the importance of maintaining health and not defecating
	2	Prepare regional planning and policy documents regarding wastewater
	3	Prepare Regional Regulations on waste water management
	4	coordinating, cooperating with private parties and donors in waste water management budgeting
	5	optimizing funding sources for the State Budget, Provincial, City Budget and grant funds for wastewater development activities

	6	conduct community awareness in waste water management.
	7	Increase the role to the media and environmental health cadres in the promotion and outreach on waste water management of the community level.
	8	improve facilities and access to household wastewater treatment through the application of on-site (local) and off-site (centralized) technology
	9	optimizing the role and coordination between SKPD related to wastewater management.

Solid Waste Management

Based on the results of Strength Weakness Opportunity Threat in waste management obtained several strategies, namely:

Table 5. Waste Management Strategy

Component		Strategy
Solid Waste Management	1	Increasing the capacity of transport infrastructure and facilities (garbage trucks, three-wheeled vehicles and containers)
	2	Increase regional budget for waste management
	3	Provision of TPA Facilities
	4	Utilizing local media as a means for socialization about waste management
	5	Increasing cooperation with the private sector and the community in waste management
	6	Conduct community development and construction of 4R waste treatment facilities and their accessories.
	7	Improve the pattern of cooperation and coordination between SKPD in waste management

Drainage Management

Drainage treatment plan is prepared based on indicators of standing water, physical condition of existing buildings and availability of drainage infrastructure facilities [6], [7]. Drainage management strategies that are prioritized are areas that have a high population density and areas that occur inundation. There are several strategies in handling drainage, namely:

Table 6. Drainage Management Strategies

Component		Strategy
Drainage Management	1	Prepare regulatory documents / regulations regarding the management of urban drainage / main drainage
	2	Perform periodic maintenance of drainage channels
	3	Carry out construction and rehabilitation of urban drainage channels / main drainage
	4	Carry out socialization, campaigns and recommendations on management and use of drainage
	5	Increase cooperation from stakeholders in the development of Drainage (government, community, NGOs, private sector).
	6	Development of operating capacity and maintenance of facilities and infrastructure built.

IV. DISCUSSIONS

Sanitation as one aspect of development has an important function in supporting the level of community welfare because it is related to health, lifestyle, environmental conditions of settlements, aesthetics and comfort in daily life. Sanitation is one of the most important factors in realizing services related to poverty alleviation and increasing productivity. However, it is still often found that aspects of sanitation development, which include wastewater, solid waste and drainage, including the provision of sanitary water and washed and Healthy Living Behavior, are however operating independently. The handling of environmental sanitation by the government so far has faced many obstacles. The number of facilities is not proportional to population growth. In addition, people in many areas still practice unhealthy living behaviors, such as defecating in any place, washing in dirty river water, and littering. The results from the study based on SEM analysis, showed that the magnitude of the influence of environmental knowledge on attitudes in managing the environment amounted to 0.68 with a probability value (P) 0.00001 stated that environmental knowledge influenced attitudes in managing the environment. Referring to the coefficient sign, it is concluded that the influence of environmental knowledge on community attitudes in handling environmental sanitation is positive with the tendency of community attitudes in handling sanitation along with increasing environmental knowledge. This is in line with the results of the 2015 Tyrsa CN Monintja study [8]. The Relationship between Individual Characteristics, Knowledge and Attitudes with the Action of DBD PSN Community of Malalayang I am Sub-District of Malalayang City of Manado that there is a relevant relationship between knowledge and PSN DBD actions, and there is a relevant relationship between attitudes with DBD PSN actions. Where attitude is the most dominant variable. Knowledge or cognitive is also a very important domain for the formation of a person's actions (event behavior). From experience and research, it turns out that behavior based on knowledge will be more lasting than behavior that is not based on knowledge. Knowledge is very closely related to education, where it is expected that with higher education, the person will also broaden his knowledge [9]–[11]. From experience and research, it is proven that behavior based on knowledge will be more lasting than behavior that is not based on knowledge. While environmental knowledge has no effect on people's behavior in handling environmental sanitation [9], [12], [13]. With the magnitude of the influence of environmental knowledge on community behavior in handling environmental sanitation by 0.221 with a probability value (P) 0.055. This is in line with research conducted by Siti Nur Djannah, 2010 with the title of the relationship between the level of knowledge and attitudes with the behavior of preventing TB transmission in students in the Manokwari Sleman hostel in Yogyakarta. Based on the results of cross tabulation analysis obtained with Sig 0.904 and R 0.21 while R square 0.00, which means knowledge has no relationship with behavior [14].



V. CONCLUSIONS

The results of the study based on SEM analysis, showed that the magnitude of the influence of environmental knowledge on attitudes in managing the environment amounted to 0.68 with a probability value (P) 0.00001 stated that environmental knowledge influenced attitudes in handling environmental sanitation. While environmental knowledge has no effect on people's behavior in handling environmental sanitation. With the magnitude of the influence of environmental knowledge on community behavior in handling environmental sanitation by 0.221 with a probability value (P) 0.055. The results of the study suggest that it can be an additional source of information for health practitioners as a reference in carrying out further research and as a material consideration for making policies, especially about matters relating to environmental sanitation.

REFERENCES

1. WHO and Unicef, "Progress on Sanitation and Drinking Water 2013 Update," *World Health*, 2013.
2. United Nations, "The Sustainable Development Goals Report," *United Nations Publ.*, 2017.
3. R. A. Etzel, "Sanitation and Hygiene," in *Textbook of Children's Environmental Health*, 2014.
4. M. Winker, B. Vinnerås, A. Muskolus, U. Arnold, and J. Clemens, "Fertiliser products from new sanitation systems: Their potential values and risks," *Bioresour. Technol.*, 2009.
5. A. M. Metwally, A. Saad, N. A. Ibrahim, H. M. Emam, and L. A. El-Etreby, "Monitoring progress of the role of integration of environmental health education with water and sanitation services in changing community behaviours," *Int. J. Environ. Health Res.*, 2007.
6. K. K. Kefeni, T. A. M. Msagati, and B. B. Mamba, "Acid mine drainage: Prevention, treatment options, and resource recovery: A review," *Journal of Cleaner Production*. 2017.
7. A. H. Elliott and S. A. Trowsdale, "A review of models for low impact urban stormwater drainage," *Environ. Model. Softw.*, 2007.
8. T. C. N. Monintja and K. Kunci, "Hubungan antara Karakteristik Individu, Pengetahuan dan Sikap dengan Tindakan PSN DBD Masyarakat Kelurahan Malalayang I Kecamatan Malalayang Kota Manado," *JIKMU*, 2015.
9. K. A. Miller, K. F. Thompson, P. Johnston, and D. Santillo, "An overview of seabed mining including the current state of development, environmental impacts, and knowledge gaps," *Frontiers in Marine Science*. 2018.
10. S. Chelli *et al.*, "Plant–environment interactions through a functional traits perspective: a review of Italian studies," *Plant Biosyst.*, 2019.
11. P. Singh, "Lean in healthcare organization: an opportunity for environmental sustainability," *Benchmarking*, 2019.
12. M. G. Porpora, I. Piacenti, S. Scaramuzzino, L. Masciullo, F. Rech, and P. B. Panici, "Environmental contaminants exposure and preterm birth: A systematic review," *Toxics*. 2019.
13. [H. R. Safavi, M. H. Golmohammadi, and S. Sandoval-Solis, "Expert knowledge based modeling for integrated water resources planning and management in the Zayandehrud River Basin," *J. Hydrol.*, 2015.
14. S. N. Djannah, D. Suryani, and D. A. Purwati, "Hubungan Tingkat Pengetahuan Dan Sikap Dengan Perilaku Pencegahan Penularan Tbc Pada Mahasiswa Di Asrama Manokwari Sleman Yogyakarta," *J. Kesehat. Masy. (Journal Public Heal.*, 2014.