JOCAE
Journal of Character and Environment
JOCAE 2(1): 65–79
ISSN 3025-0404

Institute for Advanced Science, Social and Sustainable Future
MORALITY BEFORE KNOWLEDGE

Behavior of coastal communities in dealing with microplastic pollution in salt ponds in Cirebon Regency

Ayu Dwi Astuti [1], Evi Frimawaty[1]*, Dwiyitno[2]

[1] *School of Environmental Science, Universitas Indonesia, Jl. Salemba Raya Kampus UI Salemba No. 4, Jakarta Pusat, DKI Jakarta 10430, Indonesia;*

[2] *Research Center for Food Technology and Processing, National Research and Innovation Agency, Republic of Indonesia, Yogyakarta 55861, Indonesia.*

*Correspondence: evi.frimawaty11@ui.ac.id

Received Date: April 28, 2024 Revised Date: July 29, 2024 Accepted Date: July 30, 2024

ABSTRACT

Background: Cirebon Regency, as one of the national salt-producing centers located on the coast of the North Coast of Java is vulnerable to plastic waste pollution originating from rivers and marine debris that washes up on the beach. The purpose of this study was to analyze an assessment of the correlation between aspects of knowledge and attitudes towards the behavior of coastal communities in domestic plastic waste was also carried out to be used as a basis for preparing strategies for managing domestic plastic waste in coastal communities. **Methods**: The research method used is a combination of quantitative and qualitative methods consisting of a shoreline survey methodology, river waste abundance, laboratory analysis, statistical analysis, questionnaires, semi-structured interviews, and descriptive analysis. **Findings:** Pearson's correlation analysis showed that there was a strong (r = 0.664) and significant (0.000) positive relationship between aspects of knowledge and behavior, then aspects of attitude and behavior had a very weak positive relationship (r = 0.183) and significant (0.028). **Conclusion**: The community has not been pro-environmental due to the uneven distribution of available cleaning facilities. The conclusion of this study is that education, community empowerment, collaboration between village and local officials, and additional cleaning facilities are needed to reduce the problem of domestic plastic waste. **Novelty/Originality of this Study:** The originality of this study lies in its examination of microplastic contamination in salt ponds, directly assessing the sources of contamination from raw materials and domestic waste in Cirebon Regency, a primary salt production area in Indonesia. This focus on the direct assessment of microplastic abundance in production units, rather than commercial products, provides novel insights into the impacts of plastic pollution on food safety and local salt quality.

KEYWORDS: Cirebon Regency; coastal communities; microplastic pollution.

1. Introduction

The focus on improving marine economic development is outlined in the RPJMN 2020-2024 through the 7 Development Agenda, including Strengthening Economic Resilience for Quality and Equitable Growth by Improving Maritime and Marine Management. The salt commodity is one of the priorities and included in the Strategic Plan of the Ministry of Maritime Affairs and Fisheries for 2020 – 2024 as stated in NAWACITA. Salt as one of the strategic commodities plays an important role in human life, both as a consumption material, preservative, and for industrial needs. Therefore, the Indonesian government targeted to reach the national demand of salt consumption from 3 million tons

Cite This Article:
Astuti, A. D., & Frimawaty, E. (2024). Behavior of coastal communities in dealing with microplastic pollution in salt ponds in Cirebon Regency. *Journal of Character and Environment,* 2(1), 65-79. https://doi.org/10.61511/jocae.v2i1.2024.780

to 3.4 million tons in 2024. Currently, Indonesia still imports salt to supply the domestic demand, especially industry.

According to Bramawanto (2017), Indonesian salt businesses are generally operated on a small business scale of 0.3 – 1.7 hectares/person, that are obtained from the process of evaporation of seawater using solar energy and influenced by the tropical climate. Around 85% of Indonesia's salt production comes from smallholder salt, and only 15% of the total salt production is produced by PT. Garam. In addition to increasing the income of salt farmers, salt production activities also have positive cascading effects. These effects include the opening of new opportunities and jobs for coastal communities, which can reduce poverty.

In recent years, plastic waste pollution in waterways has become an unrecognized threat to food safety and salt quality. Data from the Indonesian Plastic Industry Association (INAPLAS) and the Central Bureau of Statistics (BPS), states that Indonesia's plastic waste reaches 64 million tons per year. As stated by Jambeck et al. (2015), it is estimated that 275 million tons of plastic waste were generated worldwide in 2010, of which 4.8 – 12.7 million tons were wasted and polluted the oceans, and Indonesia is in the second position out of 20 countries that have the largest volume of plastic waste in the oceans. The increasing consumption of plastics for industrial raw materials, such as packaging, electronics, and the like, as well as from human activities on land such as the handling of plastic waste (Cordova and Riani, 2021), making plastic waste a major source of pollution into the aquatic environment (Duis and Coors, 2016). Furthermore, between 1.15 – 2.41 million tons of plastic flow from global river systems into the oceans each year and the 20 rivers that pollute the ocean the most are mostly located in Asia which accounting for more than two-thirds (67%) of the annual global input (Lebreton et al., 2017).

Cirebon Regency is part of the North Coast of Java region that has high maritime economic activity. In addition to being a coastal area producing capture fisheries and aquaculture, Cirebon Regency is a national salt production center and the number one in Indonesia in 2014. With a salt pond area of 2,839 ha and 1,558 ha, Cirebon Regency contributed 135,965 tons and 2,671 tons of national salt in 2019 and 2020, respectively. The degradation of environmental quality and land quantity of salt ponds occurs along with the increasing population. The development and activities of a coastal area can cause several impacts to the environment, one of which is leading impacts on the environment, one of which is the generation of domestic waste, including plastic waste.

Marine ecosystems are composed of biological and non-biological components. Food safety research on non-biological marine products, namely salt, has been conducted but is still limited to packaged commercial salt products. Research on the abundance of microplastics directly in salt pond production units by analyzing the source of contamination from raw materials, namely marine debris and domestic waste, has not been done much, especially in Cirebon Regency as one of the national salt production centers. Law No. 18/2012 on Food states that "Food safety is the conditions and efforts needed to prevent food from possible biological, chemical, and other contaminants that can interfere with, harm, and endanger human health and do not conflict with the religion, beliefs, and culture of the community so that it is safe for consumption". Although microplastics are not defined as toxic compounds with specific toxicity, many studies show microplastics act as carriers of organic and microbial pollutants whose presence violates food purity, making them a new type of food contaminant.

Through the 2020 – 2024 RPJM program, the Central Government and KKP focus on increasing the production and quality of national salt produced. The success of the program requires the participation of the community, business actors, and a good and good environmental carrying capacity. Cirebon Regency is one of three regions that is promoted to become the backbone of the economic backbone of the Java Island corridor. Coastal communities with all characteristics, activities, and behavior are opportunities and challenges for the government program to run as targeted. government program to run as targeted. Therefore, it is necessary to conduct research on the behavior of coastal communities in Cirebon Regency towards domestic plastic waste.

1.1 Coastal community behavior

The definition of coastal communities according to Law No. 27 of 2007 Article 1 Number 32 is "a group of indigenous peoples or local communities who live or live in coastal areas and small islands". These communities have a unique culture related to their dependence on the utilization of coastal resources and environments (Kristiyanti, 2016), both for fishing activities, inland fisheries, salt ponds and the development of the potential of coastal areas into marine tourism. Currently, local wisdom still dominates so that coastal communities tend to have their own customs and ways of managing the environment for generations. Local wisdom is an accumulation of knowledge and policies that grow and develop in a community that describes theological, cosmological, and sociological perspectives (Juanda et al., 2015).

Coastal communities in managing natural resources are still traditional and local, where the structure and activities of the community are still simple. In detail, Wahyudin (2003) suggests that the management of natural resources of coastal communities has the following characteristics: 1) Natural resources are managed sustainably; 2) The parties involved are still simple; 3) The pattern of use is limited on a small scale; 4) The nature of the community and its activities are homogeneous (fishers/assisted pond farmers); 5) The management component originates and is rooted in the community; 6) Important level of ownership and dependence on natural resources.

Environmental problems have become a principal issue, especially due to the behavior of people who do not care about the environment, resulting in environmental pollution. Human behavior can operationally be said to be a human reaction to a stimulus from outside the subject (Notoatmodjo, 2010), meaning that behavior is a manifestation of individual emotional statements and opinions when dealing with the environment, from the most visible to the invisible, from the felt to the unfelt. Behavior then means a set of actions of a person in responding to something and making a habit based on the values believed. Human behavior is human action or activity, both observable and unobservable through interactions between humans and their environment (Duch, 2017).

Environmental Education or environmental education is a process to build a human population that is aware of and concerned about the environment including problems related to it. Humans must have the knowledge, skills, attitudes, and behaviors to commit and cooperate, both individually and together, to solve various environmental problems and prevent new problems from arising. The core of this concept is education that not only focuses on three aspects: affective, cognitive, and psychomotor, but also how to insert messages about caring for the environment so that people can be smart in their behavior, especially those related to environmental issues. Hungerford and Volk (1990) introduced a simpler behavior model presented in Figure 1.

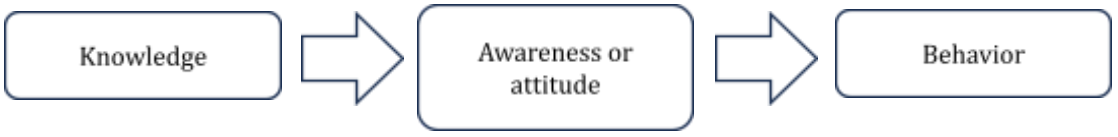

Fig.1. Behavior change model
(Hungerford and Volk, 1990)

The figure above explains that if a person is better informed, they will become more aware of environmental issues and their consequences, which will motivate them to behave in an environmentally responsible manner. So, as knowledge increases, environmentally friendly attitudes will lead to the development of responsible environmental actions. Pro-environmental behavior change is the clear goal of environmental education and science. The activities of citizen participation in environmental conservation can be driven by strengthening volunteer environmentalist organizations. This participation is equipped with the dimensions of knowledge, skills and

character values of environmental care so that citizens are formed who are sensitive to environmental protection and conservation issues. Green (1980) in Terry, (2021) states that behavior is determined or formed from predisposing factors, which include knowledge, attitudes, beliefs, beliefs, values and so on. Behavior that goes through a process based on knowledge, awareness/positive attitude, then the behavior will be long lasting compared to behavior that is not based on knowledge (Notoatmodjo, 2010). Then attitude is a state that is easily influenced by input from a person, idea, or object that contains cognitive, affective, and behavioral components (Notoatmodjo, 2007).

According to Ingold (2002), the source of many environmental problems arises from the high degree of human alienation from the world around them. This means that if humans do not have a connection from the physical processes that occur in the environment and do not get feedback from these processes, humans cannot evaluate the consequences of their actions on the environment so that no learning can be obtained. Community behavior in disposing of and managing waste is certainly an awareness of individuals and community groups of the importance of protecting the environment. A polluted environment will negatively impact health and the sustainability of an ecosystem.

Most of the leading economic activities of coastal communities are fishing and tourism activities by utilizing the land, water and open sea environment. The majority of coastal communities earn a living as fishermen and have different characteristics from other communities. These differences are caused by the economic characteristics of the region, cultural background, and the close relationship between supporting facilities and infrastructure availability. According to Primyastanto et al. (2010), the reasons why coastal communities often damage the coastal environment are the lack of public awareness and understanding of coastal area policies, low levels of education, the nature of community character, and pressure on living costs. Data from the Ministry of Maritime Affairs and Fisheries noted that small and traditional fishermen are increasingly difficult to make a profit given the high risk of going to sea due to extreme weather and ocean waves. The number of fishermen decreased from 3.44 million in 2004 to only 2.24 million in 2017. According to data from the Central Bureau of Statistics, the number of fishing households (capture fisheries and aquaculture) has decreased by around 850 thousand tons in 18 years, from 2.49 million to 1.64 million in 2018 (BPS, 2020a).

Coastal communities are generally difficult groups to organize (Fama, 2016). As a result, the community moves in informal units without having a certain direction. The low awareness of coastal communities of the strategic value of coastal areas and small islands in paying attention to management to maintain their sustainability is triggered by several factors. These factors are that coastal area residents have a relatively low economic level (Kristiyanti, 2016), so access to higher education is limited, which ultimately affects the quality of human resources (Natalia and Alie, 2014). Then because they only rely on the west season to fish, the income of coastal residents is reduced so that their level of welfare is low (Susiloningtyas, 2019). Settlements in coastal villages that are usually inhabited by low-income fishermen make settlements uninhabitable and crowded (Marwasta and Priyono, 2016). Furthermore, opportunities for coastal communities.

1.2 Microplastic

Plastic waste that cannot be biodegraded is categorized into several types, namely: macro particles (>20 mm in diameter), meso debris (5 – 20 mm) and micro particles (<5mm) (Barnes et al., 2009; Auta et al., 2017; Renzi and Blašković, 2018). Furthermore, plastics in nature that are continuously exposed to sunlight, water, or ocean waves will break down into microplastics in the form of fragments, films and fibers (Mauludy et al., 2019). The abundance of microplastics is highly correlated with population (Harahap, 2021) and meso plastic waste for most types of plastic materials (Lee et al., 2013).

Microplastics were found in sediments on the beaches of marine tourism destinations in Badung Regency, Bali with an average abundance of 90.7 ± 59.1 particles / kg (Mauludy et al., 2019). Furthermore, according to Yuliadi et al. (2017), the source of microplastic

pollution of fragment types in Banyuurip waters, Gresik, East Java comes from household waste and anthropogenic activities with an abundance of 7.11-8.89 particles/m^3 in pond, estuarine and marine locations. Thus, it can be assumed that the source of polluted raw materials affects the yield of salt produced by salt farmers on the Java Coast. According to Hodson et al. (2017), plastic particles <5 mm in size and included in the class of pollutants that can be found in soil and water and have effects on ecosystems and food chains due to bioaccumulation are called microplastics. Microplastics are identified in various colors, including black, white, red, green, blue, brown, yellow, orange, and white (Hidalgo-Ruz et al., 2012). The black color indicates that the microplastics have a high chemical content. Shape and microplastic variation can be used to determine the source of the plastic particles.

Microplastics that accumulate in the ocean will accumulate and form complexes with persistent organic pollutants (POPs), such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and organochlorine pesticides such as dichlorodiphenyltrichloroethane (DDT) or hexachlorobenzene (HCB) (Smith et al., 2018). It was found that 21 samples of commercial table salt produced between September 2016 and June 2017 by salt companies in Spain contained microplastics (Barboza et al., 2018). Meanwhile, *Aeromonas salmonicida,* a pathogenic bacterium in fish, was found in the bacterial community on the surface of microplastics in the North Adriatic waters. This suggests that microplastics have become an important means of transporting microorganisms (Viršek et al., 2017). The source of microplastics can come from waste disposal and garbage from shops and food stalls around the water in the form of plastic bags, Styrofoam, fast food packaging, and plastic beverage bottles (Soares et al., 2021; Heidbreder et al., 2019). Microplastics consist of fibers, fragments, films, and granules which are described in the next subchapter.

2. Methods

This research uses a quantitative approach with a mixed method. The mix method is a form of effort to facilitate various shortcomings in two research approaches. This method aims to answer research questions that encounter obstacles due to research restrictions (Parjaman and Akhmad, 2019). Furthermore, this combination method is useful for researchers in terms of data detail (Johnson & Onwuegbuzie, 2007). The quantitative method in this study was conducted to see the understanding of coastal communities. While the qualitative method was used for SWOT analysis.

The research was carried out within 5 months, starting from December 2021 to April 2022, then continued with the preparation of the research results. The research site is located in the coastal area of the north coast of the island of Java, namely Cirebon Regency, precisely in Pangenan District. During the activities, primary data collection and secondary data have been carried out, processing and analysis of data obtained.

2.1 Coastal community behavior

The behavior of coastal communities towards domestic plastic waste was analyzed using the Pearson Product Moment model using SPSS software version 22. The method was chosen because the data is ordinal with the data measurement scale interval where aspects of community knowledge and attitudes will be tested.

To determine its relationship (associative) with behavior towards domestic plastic waste in coastal areas. Respondents are the subject of the research, so the intended or explored subjects must represent the real situation based on what they know and understand. Therefore, the criteria for respondents in filling out the questionnaire were determined as follows: (i) respondents are the people of Pengarengan Village, Cirebon Regency; (ii) respondents are adults aged at least 15 years (15 – 20 years, 21 – 25 years, 26 – 30 years, 31 – 35 years, 36 – 40 years, >40 years); (iii) respondents are male or female; (iv) respondents are not limited in terms of education level; and (v) occupation.

Measurement of positive or negative responses to the understanding of a statement is expressed in a Likert measurement scale. The answer to each item in the questionnaire instrument has a level from the most positive to the most negative, namely 1 for Strongly Disagree; 2 for Disagree; 3 for Undecided; 4 for Agree; and 5 for Strongly Agree. The value of the interval level of interpretation of the average value response is then measured using the following Equation 1 (Sugiyono, 2017).

$$\text{The interval level value} = \frac{\textit{The highest value} - \textit{The lowest value}}{\textit{The number of statement criteria}} \qquad \text{(Eq.1)}$$

$$= \frac{5-1}{5} = 0.8$$

The results of the average value of respondents' responses were transformed by providing an interpretation according to the criteria presented in Table 1.

Table 1. Mean value response interpretation

Scale	Interpretation
1.00 - 1.80	Not very good
1.81 - 2.60	Not good
2.61 - 3.40	Less good
3.41 - 4.20	Good
4.21 - 5.00	Very good

To evaluate the relationship between aspects of knowledge and attitudes with community behavior related to plastic waste that pollutes the environment, it was analyzed using Pearson Product Moment model inference statistics using SPSS software version 22. The results of the analysis will explain the strength of the relationship between variables presented in Table 2.

Table 2. Pearson product moment correlation

Value interval	Relationship strength
0.000 - 0.199	Very weak
0.200 - 0.399	Low or weak
0.400 - 0.599	Medium or fair
0.600 - 0.799	Strong
0.800 - 100	Very strong

(Sugiyono, 2013)

As data is collected from respondents using questionnaire instruments, the quality of the questionnaire and the respondents' ability to answer the questions are very important in the survey. If the tools used to collect data are not valid, the findings obtained will not be able to explain the current situation. Therefore, this study tested the validity and reliability of the tools used in the study.

2.2 Validity test

According to Arikunto (2013), data that can be trusted in accordance with the actual conditions is called validity. Validity shows the level of accuracy between the data actually generated by the object and the data collected by the researcher. Validity testing helps determine whether questionnaire questions are considered irrelevant and need to be discarded / replaced.

The validity test decision criteria are as follows: (i) If r count $\geq$ r table, then the items are valid. If r count < r table, then the question items of the questionnaire are valid. (ii) If r count ;< r table, then the question items of the questionnaire are invalid. Testing is done by correlating the item score of each statement with the total score so; as to produce an interpretation of the correlation coefficient. If the correlation of each factor is positive and

greater than r table, it can be concluded that the validity of the device design is good (Sugiyono, 2017).

2.3 Instrument reliability test

Reliability means with regard to the degree of data consistency. This test is used to determine whether the data collection instrument, in this case a questionnaire, shows the level of accuracy, accuracy, stability, or consistency in revealing a certain condition. (Sugiyono, 2018). The Cronbach's Alpha coefficient method used uses the following Equation 2, where r11 is the reliability of the instrument, $\sum \sigma b^2$ is the sum of item, and variances k is the number of questions. The reliability testing criteria are as follows: (i) If > 0.60, the device is reliable or reliable; (ii) If < 0.60, the device is not reliable or unreliable (Sujarweni, 2014).

$$r11 = \frac{k}{k-1}\left[1 - \frac{\sum \sigma b^2}{\sigma 1^2}\right] \quad \text{(Eq. 2)}$$

3. Result and Discussion

3.1 Sociodemographic characteristics of respondents of coastal communities in Pengarengan village

The ratio of female respondents was greater (59%) than male (41%). The age range of respondents is 16-76 years, where the percentage proportion is balanced between young age, 55% in the age range of 15-40 years and old age, 45% in the age range of >40 years. Respondents have varied educational backgrounds, where the percentage of elementary school education is the most dominant at 44%, followed by high school graduates at 25%, junior high school 17% and no schooling at 14% (Figure 2).

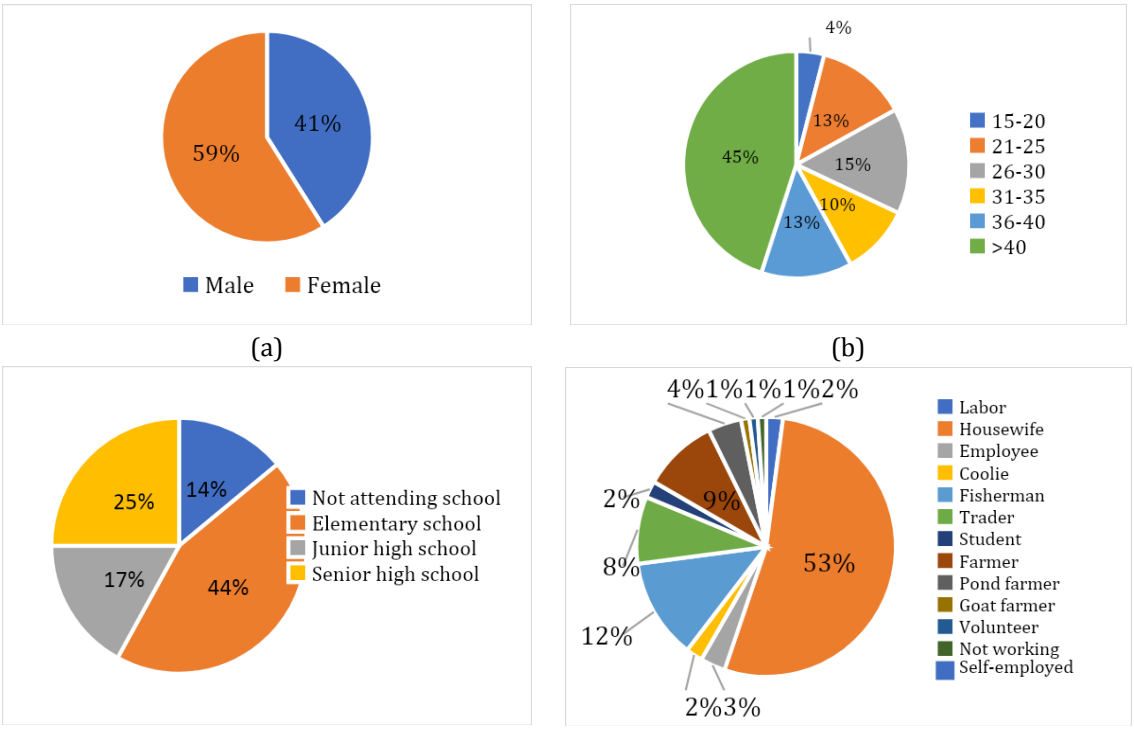

Fig. 2. Characteristics of respondents in Pengarengan Village based on sociodemographics (a) Gender; (b) Age; (c) Latest education; (d) Occupation

In terms of daily activities, the coastal communities of Pengarengan Village have various activities, including taking care of households (51%), fishermen (12%), field farmers (9%), traders (8%), farmers (4%), entrepreneurs (4%), others (21%), and not working (1%). The proportion between working and taking care of the household for the population of Kabupaten Cirebon aged 15 years and above based on the type of activity is in line with the population data of BPS Kabupaten Cirebon in 2020 (BPS, 2020b). Data on the sociodemographic characteristics of respondents are presented in Figure 2.

3.2 Analysis of the relationship between aspects of knowledge and attitudes with the behavior of coastal communities in Pengarengan village towards plastic waste

Environmental pollution in an area occurs because of the behavior of people who do not care about the environment. Behavior is formed because it is influenced by several factors, including the level of knowledge they have and how the response or action is expressed by attitudes related to environmental pollution due to plastic waste in the area where they live. The relationship between knowledge with behavior and attitude with behavior was then carried out to 110 respondents who live and move around the coastal area.

The results of the questionnaire were analyzed through the calculation of the frequency of answer scores on each aspect. After that, the relationship between variables was analyzed using the Pearson Product Moment test with a 95% confidence level (sig < 0.05). Descriptive statistical analysis of the three research variables stated that aspects of public knowledge of environmental pollution due to plastic waste from the Likert scale model statement results in an average value = 4.08. Then on the attitude aspect, the statement produces an average value = 2.89 and on the behavior aspect produces an average value = 2.89. From these results, it can be concluded that the knowledge and behavior of the community of Pengarengan Village, Pangenan Subdistrict, Cirebon District are in the particularly good and good categories, but less good for the attitude aspect. Interpretation of the Average Value of Community Response in Pengarengan Village between aspects is presented in Table 3.

Table 3. Interpretation of average value of community response in Pengarengan Village

Aspects		Total assessment score from respondents					Average	Conclusion
		5	4	3	2	1		
Knowledge	X1.1	54	50	3	3	0	4.41	Very good
	X1.2	47	57	5	1	0	4.36	Very good
	X1.3	20	51	9	28	2	3.54	Very good
	X1.4	27	64	11	8	0	4.00	Good
	X1.5	39	66	2	3	0	4.28	Good
	X1	Conclusion knowledge					408	Very good
Attitude	X2.1	0	0	5	81	24	1.83	Not very good
	X2.2	36	54	11	9	0	4.06	Good
	X2.3	1	9	22	62	16	2.25	Very unfavorable
	X2.4	2	14	17	60	17	2.31	Not very good
	X2.5	33	57	9	11	0	4.02	Good
	X2	Attitude conclusion					2.89	Not so good
Behavior	Y1	17	57	12	23	1	3.60	Good
	Y2	27	64	11	8	0	4.00	Good
	Y3	20	65	16	9	0	3.87	Good
	Y4	30	60	16	4	0	4.05	Good
	Y	Behavioral conclusion					3.88	Good

Pearson Product Moment correlation analysis used for the variable aspects of knowledge (X1) and behavior (Y) shows that there is a positive relationship where the correlation coefficient value is r = 0.664, with a significance level of 0.000 (sig. <0.05) or

there is a strong and unidirectional relationship between knowledge and the behavior of the Pengarengan Village community related to pollution. The environment due to plastic waste so it can be concluded that the hypothesis is accepted. Pearson Product Moment correlation analysis used for variable aspects of attitude (X2) with behavior (Y) shows that there is a positive relationship where the correlation coefficient value is r = 0.183, with a significance level of 0.028 (sig. <0.05) or there is a very weak and unidirectional relationship between attitudes and behavior of the Pengarengan Village community related to environmental pollution due to plastic waste, so it can be concluded that the hypothesis is accepted.

The results of this study are in line with the results of research by Gusti et al. (2015), which states that there is a positive (r = 0.330) and significant (sig = 0.001) relationship between knowledge and waste management behavior, where general knowledge about the environment is significantly able to predict waste management behavior. Differences in a person's level of knowledge can be influenced by several factors, including education level, age, environment, information, and experience both alone and from others which in turn affect a person's attitudes and actions in decision making, especially in terms of household waste management (Sugiarto and Gabriella, 2020).

A person's level of education will affect participation in waste management activities, the higher a person's level of education, the easier it is to provide information and guidance (Khoiri and Rudiansyah, 2019). In this study, although the knowledge of Pengarengan Village residents is in the very good category, the majority of the population has an elementary school level education (44%), meaning that the knowledge gained is more from experiences that occur compared to formal knowledge from advanced schooling. The adverse experience of the community around the Pengarengan River, namely flooding and the pungent odor that comes from garbage in the river, made the community know that waste pollution has a bad impact on the environment in which they live.

Low levels of education also tend to make people uninterested in trying new things, especially in terms of sorting and recycling waste (Putra et al., 2013). The results showed that the attitude aspect had a poor category, this could be due to a lack of information on how to manage waste (Ashar, 2020). In line with the results of research conducted by Wildawati, (2020), which states that respondents' unfavorable attitudes will be 2 times more likely not to carry out waste management. Attitude is a reaction that is still closed in nature and cannot be said to be an action or an activity, but is a form of behavioral predisposition (Notoatmodjo, 2007).

Another factor that can cause someone not to be pro-environment is the lack of trash can facilities. The results of research by Putra et al. (2013), stated that the respondents' attitude did not apply what they knew to participate in managing waste due to the lack of trash can facilities provided so that environmental care behavior did not appear. This statement is in line with the results of this study which explain that attitude has a positive relationship with behavior. Furthermore, Mulasari, (2013) also stated that the poor attitude of the community in Dukuh Hamlet in processing waste was due to the absence of waste transportation facilities and infrastructure. Based on the results of questionnaires and environmental observations, the community knows not to burn, hoard, and litter. In practice, this knowledge is not applied in daily attitudes due to the lack of waste collection facilities and not knowing how to recycle. Waste is still burned in the yard or dumped behind the house, which is the access to the Pengarengan River. However, the Pengarengan Village community is enthusiastic about recycling waste so that it has economic value if facilitated through community empowerment activities.

According to the theory of Environmental education (EE) proposed by Hungerford and Volk (1990), with education, behavior can be formed in accordance with the desired because the individual obtains information that can be used to improve behavior increase their knowledge of a concept and then give rise to the intention to behave and take action. Increased knowledge will lead individuals to a positive attitude which will then lead them to the desire to act to make the environment better. The assumption that arises is that if

people get a lot of knowledge about the environment, they will be more aware of the environment and its problems so that they are motivated to have a positive attitude towards the environment with their behavior.

People are gradually realizing the problem of environmental pollution, especially from plastic waste, but they cannot completely stop using plastic packaging due to higher demands for convenience (Deng et al., 2020). This is evident from the results of the study that thin plastic waste wrappers are the largest percentage of debris abundance (47% and 46%). The thin plastic waste found consisted of food wrappers, plastic bags, household hygiene products, beauty products, and plastic wrap (kilo plastic). Generally, plastic waste pollutants come from the community's socio-economic activities such as household activities, tourism, maritime, and agriculture (Heidbreder et al., 2019; Wootton et al., 2022; Deng et al., 2020). The high activity of the Pengarengan Village community in the maritime sector has the potential to cause waste pollution to the surrounding environment. Another thing that might make the relationship between attitude and behavior very weak is the lack of waste management facilities. There is only one TPS located in an RW that must cross a river bridge. The results of interviews conducted with local residents stated that the lack of waste bins forced them to throw their waste into the river. So far, the policies and regulations that have been implemented by the government to reduce plastic consumption have only been limited to reducing the use of single-use plastics in the form of plastic bags and straws which were piloted in 22 regions where Cirebon Regency was not included in the list regulation. The ban on single-use plastics can reduce the use of plastic bags by 25 – 30 percent (Qodriyatun et al., 2019). However, the policy was discontinued and returned to each region.

Humans are one of the components of the biosphere where aspects of knowledge, attitudes, along with emotional involvement as a complexity called "pro- environmental awareness" have the responsibility to make the maximum contribution to creating conditions for zero plastic, clean and green environments as environmentally friendly living beings. Changes in individual behavior, especially in coastal communities, are expected so that the use of the sea and natural resources can certainly be carried out sustainably (Veronica and Calvano, 2020). Change is only possible if there is an increase in knowledge, understanding and awareness of the community from an early age. According to Portman et al. (2019), one of the ways that can be done to reduce littering behavior is to build infrastructure in the form of trash cans with attractive designs. This is in line with what was conveyed by Cingolani et al. (2016), that persuasive communication through messages in design, brochures, and notice boards can be used as a means of education for environmental management as an intervention action. Research conducted by Bouzekry et al. (2022) states that tourism activities, lack of notice boards, trash bins, and poor waste management practices are the main sources of plastic problems on three Moroccan Mediterranean beaches. The participation of children and communities in campaigns not only changes their attitudes and perceptions, but can also adopt waste minimization behaviors. The abundance of microplastics analyzed in this study includes the number, shape, and color contained in four types of samples, namely river water, sea water and pond salt at two different sampling points. The presence of microplastics in each location can be known after the sample passes through the process of hydrogen peroxide treatment, flotation and filtration stages carried out at the Central Laboratory.

4. Conclusion

Pengarengan Village community behavior related to environmental pollution due to plastic waste from the aspects of knowledge and attitudes environment due to plastic waste from the aspects of knowledge and attitude have a positive relationship with behavior, where knowledge the relationship is strong and unidirectional ($r = 0.664$, and sig. $0.000 < 0.05$), while the attitude aspect is very weak and unidirectional ($r = 0.183$, and sig. $0.000 < 0.05$). Although knowledge and behavior are in the excellent and good categories, the attitude of the community is still not pro-environment because it is not

supported by adequate TPS facilities, so that environmental care behavior is not optimal. Suggestions needed are socialization and education to coastal communities about the dangers of domestic plastic waste that can pollute salt ponds. In addition, the involvement and collaboration of various parties is needed to empower the community in waste management with the 3R principle and ensure the sustainability of the PESPA group and its work program.

Acknowledgement
The author would like to express sincere gratitude to the anonymous reviewers for their valuable feedback and constructive comments. Their insightful suggestions have significantly contributed to improving the quality and clarity of this manuscript.

Author Contribution
A.D.A. and E.F. conceived the study, carried out all research activities, analyzed the data, wrote the manuscript, and were responsible for the final content. The authors approved the final version and agreed to be accountable for all aspects of the work.

Funding
This research received no external funding.

Ethical Review Board Statement
Not applicable.

Informed Consent Statement
Not available.

Data Availability Statement
Not available.

Conflicts of Interest
The authors declare no conflict of interest.

References
Arikunto, S. (2002). *Prosedur Penelitian Tindakan Kelas*. Bumi Aksara.

Ashar, Y. K. (2020). Tingkat pengetahuan dan sikap pengelolaan sampah pada mahasiswa Fakultas Kesehatan Masyarakat UIN Sumatera Utara Medan. *Tingkat Pengetahuan Dan Sikap Pengelolaan Sampah Pada Mahasiswa Fakultas Kesehatan Masyarakat UIN Sumatera Utara Medan*, *2*(1), 28–38. http://jurnal.uinsu.ac.id/index.php/contagion/article/view/7258/3255

Auta, H. S., Emenike, C. U., & Fauziah, S. H. (2017). Distribution and importance of microplastics in the marine environmentA review of the sources, fate, effects, and potential solutions. *Environment International*, *102*, 165–176.

https://doi.org/10.1016/j.envint.2017.02.013

Barboza, L. G. A., Dick Vethaak, A., Lavorante, B. R. B. O., Lundebye, A. K., Guilhermino, L., Dehaut, A., ... & Porcher, J. M. (2018). NOAA Microplastics Methods Manual. *Marine Pollution Bulletin*.

Barnes, D. K. A., Galgani, F., Thompson, R. C., & Barlaz, M. (2009). Accumulation and fragmentation of plastic debris in global environments. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1526), 1985–1998. https://doi.org/10.1098/rstb.2008.0205

Bouzekry, A., Mghili, B., & Aksissou, M. (2022). Addressing the challenge of marine plastic litter in the Moroccan Mediterranean: A citizen science project with school children. *Marine Pollution Bulletin*, *184*(September), 114167. https://doi.org/10.1016/j.marpolbul.2022.114167

BPS. (2020a). *Statistik Sumber Daya Laut dan Pesisir 2020*. Badan Pusat Statistik. https://www.bps.go.id/id/publication/2020/11/27/643ef35d3f0ddd761b85d074/statistik-sumber-daya-laut-dan-pesisir-2020.html

BPS. (2020b). *Kabupaten Cirebon Dalam Angka 2020*. Badan Pusat Statistik. https://cirebonkab.bps.go.id/publication/2020/04/27/58a42ed615363c51758f0d0c/kabupaten-cirebon-dalam-angka-2020.html

Bramawanto, R. (2017). Desain dan layout tambak garam semi intensif skala kecil di lahan terbatas. *Jurnal Segara*, *13*(2), 159–167. https://doi.org/10.15578/segara.v13i3.6495

Cingolani, A. M., Barberá, I., Renison, D., & Barri, F. R. (2016). Can persuasive and demonstrative messages to visitors reduce littering in river beaches? *Waste Management*, *58*, 34–40. https://doi.org/10.1016/j.wasman.2016.08.028

Cordova, M. R., & Riani, E. (2021). Micro-and mesoplastics release from the Indonesian municipal solid waste landfill leachate to the aquatic environment: Case study in Galuga Landfill Area, Indonesia. *Marine Pollution Bulletin, 163*, 111986. https://doi.org/10.1016/j.marpolbul.2021.111986

Deng, L., Cai, L., Sun, F., Li, G., & Che, Y. (2020). Public attitudes towards microplastics: Perceptions, behaviors and policy implications. *Resources, Conservation and Recycling*, *163*(February), 105096. https://doi.org/10.1016/j.resconrec.2020.105096

Duch, W. (2017). *Kurt Lewin, psychological constructs and sources of brain cognitive activity*. ArXiv.

Duis, K., & Coors, A. (2016). Microplastics in the aquatic and terrestrial environment: sources (with a specific focus on personal care products), fate and effects. *Environmental Sciences Europe*, *28*(1), 1–25. https://doi.org/10.1186/s12302-015-0069-y

Fama, A. (2016). Komunitas masyarakat pesisir di tambak lorok, Semarang. *Sabda: Jurnal Kajian Kebudayaan, 11*(2), 65-75. https://doi.org/10.14710/sabda.11.2.65-75

Gusti, A., Isyandi, B., Bahri, S., & Afandi, D. (2015). Hubungan pengetahuan, sikap dan intensi perilaku pengelolaan sampah berkelanjutan pada siswa sekolah dasar di Kota Padang. *Dinamika Lingkungan Indonesia*, *2*(2), 100. https://doi.org/10.31258/dli.2.2.p.100-107

Heidbreder, L. M., Bablok, I., Drews, S., & Menzel, C. (2019). Tackling the plastic problem: A review on perceptions, behaviors, and interventions. *Science of the Total Environment*, *668*, 1077–1093. https://doi.org/10.1016/j.scitotenv.2019.02.437

Hidalgo-Ruz, V., Gutow, L., Thompson, R. C., & Thiel, M. (2012). Microplastics in the marine environment: A review of the methods used for identification and quantification. *Environmental Science and Technology*, *46*(6), 3060– 3075. https://doi.org/10.1021/es2031505

Hodson, M. E., Duffus-Hodson, C. A., Clark, A., Prendergast-Miller, M. T., & Thorpe, K. L. (2017). Plastic Bag Derived-Microplastics as a Vector for Metal Exposure in Terrestrial Invertebrates. *Environmental Science and Technology*. https://doi.org/10.1021/acs.est.7b00635

Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *Journal of Environmental Education*, *21*(3), 8–21. https://doi.org/10.1080/00958964.1990.10753743

Ingold, T. (2000). *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill (1st ed.).* Routledge. https://doi.org/10.4324/9780203466025

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science*, *347*(6223), 768–771. https://doi.org/10.1126/science.1260352.

Johnson, R. B., & Onwuegbuzie, A. J. (2007). Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research*, *1*(2), 112–133. https://doi.org/10.1177/1558689806298224

Juanda, A., Suliswanto, M. S. W., Soelistyo, A., Boedirochminarni, A., Fuddin, M. K., Zuhroh, I. F., Fitriasari, & Abdullah, M. F. (2015). *Membangun Ekonomi Nasional Yang Kokoh*. UMM Press.

Khoiri, A., & Rudiansyah, E. (2019). Hubungan antara pengetahuan pengelolaan sampah dengan perilaku peduli lingkungan (studi korelasional pada mahasiswa STKIP Melawi). *Jurnal Pendidikan Dasar*, *7*(2), 91–97. https://doi.org/10.46368/jpd.v7i2.164

Kristiyanti, M. (2016). Pemberdayaan masyarakat pesisir pantai melalui pendekatan ICZM (Integrated Coastal Zone Management). *Seminar Nasional Multi Disiplin Ilmu*.

Lebreton, L. C. M., Van Der Zwet, J., Damsteeg, J. W., Slat, B., Andrady, A., & Reisser, J. (2017). River plastic emissions to the world's oceans. *Nature Communications*, *8*, 1–10. https://doi.org/10.1038/ncomms15611

Lee, J., Hong, S., Song, Y. K., Hong, S. H., Jang, Y. C., Jang, M., Heo, N. W., Han, G. M., Lee, M. J., Kang, D., & Shim, W. J. (2013). Relationships among the abundances of plastic debris in different size classes on beaches in South Korea. *Marine Pollution Bulletin*. https://doi.org/10.1016/j.marpolbul.2013.08.013

Marwasta, D., & Priyono, K. D. (2016). Analisis karakteristik permukiman desa- desa pesisir di Kabupaten Kulonprogo. *Forum Geografi*, *21*(1), 57–68. https://doi.org/10.23917/forgeo.v21i1.1819

Mauludy, M. S., Yunanto, A., & Yona, D. (2019). Microplastic Abundances in the Sediment of Coastal Beaches in Badung, Bali. *Jurnal Perikanan Universitas Gadjah Mada*, *21*(2), 73. https://doi.org/10.22146/jfs.45871

Mulasari, S. A. (2013). Hubungan Tingkat Pengetahuan Dan Sikap Terhadap Perilaku Masyarakat Dalam Mengolah Sampah Di Dusun Padukuhan Desa Sidokarto Kecamatan Godean Kabupaten Sleman Yogyakarta. *Jurnal Kesehatan Masyarakat (Journal of Public Health)*, *6*(3). https://doi.org/10.12928/kesmas.v6i3.1055

Natalia, M., & Alie, M. M. (2014). Kajian kemiskinan pesisir di Kota Semarang (Studi kasus: Kampung Nelayan Tambak Lorok). *Teknik PWK (Perencanaan Wilayah Kota), 3*(1), 50-59. https://doi.org/10.14710/tpwk.2014.4384

Notoatmodjo, S. (2007). *Promosi Kesehatan dan Ilmu Perilaku*. Rineka Cipta.

Notoatmodjo, S. (2010). *Ilmu Perilaku Kesehatan*. Rineka Cipta.

Parjaman, T., & Akhmad, D. (2019). Pendekatan penelitian kombinasi : Sebagai "Jalan Tengah" atas dikotomi kuantitatif-kualitatif. *Jurnal Moderat*, *5*(4), 530–548. https://jurnal.unigal.ac.id/index.php/moderat

Portman, M. E., Pasternak, G., Yotam, Y., Nusbaum, R., & Behar, D. (2019). Beachgoer participation in prevention of marine litter: Using design for behavior change. *Marine Pollution Bulletin*, *144*(March), 1–10. https://doi.org/10.1016/j.marpolbul.2019.04.071

Primyastanto, M., Dewi, R. P., & Susilo, E. (2010). Perilaku Perusakan Lingkungan Masyarakat Pesisir Dalam Perspektif Islam (Studi Kasus Pada Nelayan dan Pedagang Ikan Di Kawasan Pantai Tambak, Desa Tambakrejo, Kecamatan Wonotirto, Kabupaten Blitar Jawa Timur). *Jurnal Pembangunan dan Alam Lestari*, 1(1), 1-11. https://jpal.ub.ac.id/index.php/jpal/article/view/99

Putra, H. P., Taufiq, A. R., & Juliani, A. (2013). Studi hubungan antara tingkat pendidikan dan pendapatan keluarga terhadap sikap dalam pengelolaan sampah rumah tangga.

Jurnal Sains Dan Teknologi Lingkungan, *5*(2), 99. http://journal.uii.ac.id/index.php/JSTL/article/view/3502/3095

Qodriyatun, S. N., Nurhayati, S., Yulia, Q., Elga, I., Anih, A., Suryani, S., & Prasetyawan, T. (2019). Sampah Plastik Dan Implikasi Kebijakan Pembatasan Plastik Sekali Pakai Terhadap Industri Dan Masyarakat. In *Berkas.Dpr.Go.Id*. https://intranspublishing.com/

Renzi, M., & Blašković, A. (2018). Litter & microplastics features in table salts from marine origin: Italian versus Croatian brands. *Marine Pollution Bulletin*, *135*(July), 62–68. https://doi.org/10.1016/j.marpolbul.2018.06.065

Smith, M., Love, D. C., Rochman, C. M., & Neff, R. A. (2018). Microplastics in Seafood and the Implications for Human Health. In *Current environmental health reports*. https://doi.org/10.1007/s40572-018-0206-z

Soares, J., Miguel, I., Venâncio, C., Lopes, I., & Oliveira, M. (2021). On the path to minimize plastic pollution: The perceived importance of education and knowledge dissemination strategies. *Marine Pollution Bulletin*, *171*(August). https://doi.org/10.1016/j.marpolbul.2021.112890

Sugiarto, A., & Gabriella, D. A. (2020). Kesadaran dan perilaku ramah lingkungan mahasiswa di kampus. *Jurnal Ilmu Sosial Dan Humaniora*, *9*(2), 260. https://doi.org/10.23887/jish-undiksha.v9i2.21061

Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.

Sugiyono. (2018). *Metode Penelitian Kuantitatif*. Alfabeta.

Sujarweni, V. W. (2014). *Metode Penelitian: Lengkap, Praktis, dan Mudah Dipahami*. Pustaka Baru Press.

Susiloningtyas, D. (2019). Coastal livelihood sustainability analysis of migration activity at Tanjung Luar and Salura Island Indonesia. IOP *Conference Series: Earth and Environmental Science, 338*(1). https://doi.org/10.1088/1755-1315/338/1/012032

Terry, P. E. (2021). Health Promotion Planning and an Interview With Dr. Lawrence Green. *American Journal of Health Promotion*, *35*(6), 760–765. https://doi.org/10.1177/08901171211022560

Veronica, R., & Calvano, G. (2020). Promoting sustainable behavior using serious games: Seadventure for ocean literacy. *IEEE Access*, *8*, 196931–196939. https://doi.org/10.1109/ACCESS.2020.3034438

Viršek, M. K., Lovšin, M. N., Koren, Š., Kržan, A., & Peterlin, M. (2017). Microplastics As a Vector For The Transport Of The Bacterial Fish Pathogen Species Aeromonas Salmonicida. *Marine Pollution Bulletin*, *125*(1–2), 301–309. https://doi.org/10.1016/j.marpolbul.2017.08.024

Wahyudin, Y. (2003). Sistem sosial ekonomi dan budaya masyarakat pesisir. In *Makalah Pelatihan Pengelolaan Kawasan Konservasi Perairan, Pusat Diklat Kehutanan*. https://doi.org/10.13140/RG.2.1.2522.6965

Wildawati, D. (2020). Faktor yang berhubungan dengan pengelolaan sampah rumah tangga berbasis masyarakat di kawasan bank sampah Hanasty Kota Solok. *Human Care Journal*, *4*(3), 149. https://doi.org/10.32883/hcj.v4i3.503

Yuliadi, L. P. S., Nurruhwati, I., & Astuty, S. (2017). Optimalisasi pengelolaan sampah pesisir untuk mendukung kebersihan lingkungan dalam upaya mengurangi sampah plastik dan penyelamatan pantai pangandaran. *Jurnal Pengabdian Kepada Masyarakat, 1*(1), 14-18. https://jurnal.unpad.ac.id/pkm/article/view/16270/7934

Biographies of Authors

Ayu Dwi Astuti, School of Environmental Science, Universitas Indonesia, Jl. Salemba Raya Kampus UI Salemba No. 4, Jakarta Pusat, DKI Jakarta 10430, Indonesia.

- Email:ayu.dwiastuti07@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A

Evi Frimawaty, lecturer in School of Environmental Science, Universitas Indonesia, Jl. Salemba Raya Kampus UI Salemba No. 4, Jakarta Pusat, DKI Jakarta 10430, Indonesia.

- Email: evi.frimawaty11@ui.ac.id
- ORCID: 0000-0002-9016-4062
- Web of Science ResearcherID: N/A
- Scopus Author ID: 8128517300
- Homepage: https://sinta.kemdikbud.go.id/authors/profile/6719988

Dwiyitno, Research Center for Food Technology and Processing, National Research and Innovation Agency, Republic of Indonesia, Yogyakarta 55861, Indonesia.

- Email: dwiy007@brin.go.id
- ORCID: 0000-0001-5451-1947
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A