

## Analysis of community knowledge and behavior towards plastic waste pollution control in the coastal area of Banyuwangi Regency, Indonesia

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### ABSTRACT

Banyuwangi in East Java, Indonesia was one of the districts that had the potential to produce an alarming quantity of plastic waste. The local government held a Zero Waste-Based Plastic Waste Pollution Control Facility to overcome plastic waste issues. This research aimed to analyze the effect of Zero Waste-based plastic waste pollution control on the potential for plastic waste pollution in the community of the coastal areas of Banyuwangi Regency, Indonesia. The research was conducted on the coastal areas within four sub-districts in Banyuwangi Regency, namely Muncar, Banyuwangi, Kalipuro and Blimbingsari. A total of 636 respondents were recruited. A set of questionnaires was used to obtain data for knowledge, attitude, action, pollution control and pollution potential of plastic waste. All data was analyzed using SPSS software. Respondents had sufficient knowledge (88.8 %) but lacked good attitude (65.6 %) toward plastic waste. Respondents' behavior and knowledge needed improvement, as 38.85 % of respondents were not well informed about plastic waste. Knowledge, attitudes and actions of respondents showed no influence on the potential for plastic waste pollution. The control of plastic waste through Zero Waste-Based Plastic Waste Pollution is influential on the potential for plastic waste pollution along the coast of Banyuwangi Regency. It is necessary to provide Zero Waste-Based Plastic Waste Pollution facilities and increase community awareness in order to minimize pollution of marine waters, particularly due to plastic waste.

### 1. Introduction

Plastic is a basic material for commercial products and widely used by society. However, plastic also becomes a major pollutant in the marine environment. According to Jambeck et al. (2015), 275 million metric tons of plastic waste were generated by 192 coastal countries in 2010, of which 4.8 to 12.7 million metric tons entered the ocean. Plastic waste is a challenge in almost all regions of Indonesia due to community activities and life support facilities. The presence of plastic waste in the marine environment is already a well-known global issue.

Pollution from plastic waste in the marine environment may occur

due by direct or indirect disposal of plastics into the ocean by humans, which includes activities such as oil platforms, fishing, cruise ships, and activities in densely populated areas where plastics are carried into the ocean by wind, water runoff, or directly dumped into the ocean (Nerland et al., 2014). Many marine species, such as fish, seabirds and marine mammals, can ingest plastic mistaken for food. Ingested plastic can cause poisoning, digestive problems and even death for the animals (Jawad, 2021). Plastic waste floating in the ocean can disrupt marine ecosystems, especially coral reefs and seafloor habitats. Plastic that settles on the seafloor can harm the habitat of various species and change the overall condition of the ecosystem.

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Challenges in various sectors in the waste management system are no exception in Banyuwangi Regency, Indonesia. As the largest district in East Java (5782.50 km<sup>2</sup>), with a population growth rate of approximately 0.44 % (BPS, 2021), is potentially generating an alarming number of waste in both quantity and quality. Moreover, Banyuwangi Regency offers excellent coastal and marine tourism potential, yet plastic waste is dumped into the sea in an environmentally unfriendly manner, with estimates of 4.8–12.7 million tons of plastic waste ending up in Indonesia's oceans (Jambeck et al., 2015). To address plastic waste, the Banyuwangi Regency Government made a breakthrough by provide the Zero Waste-Based Plastic Waste Pollution Control Facility as a control of plastic waste pollution. The facility is expected to control plastic waste pollution in coastal communities. Beyond being a controller, this facility is also expected to educate the community regarding the importance of knowledge and behavior towards plastic waste pollution control. This study aims to analyze the relationship between community knowledge and behavior towards controlling plastic waste pollution in the coastal area of Banyuwangi Regency, Indonesia. According to previous research, littering behavior is still high in Banyuwangi with a percentage of 69 % (Marpaung et al., 2022).

Beyond being a controller, the Zero Waste-Based Plastic Waste Pollution Control Facility in Banyuwangi is also expected to educate the community regarding the importance of knowledge and behavior towards plastic waste pollution control. Previous studies have shown that the existence of waste-related facilities or policies will improve the knowledge and behavior of the community (Anua et al., 2022; Northen et al., 2023; Xu et al., 2022). For example, in Malaysia, the existence of a reduce, reuse, and recycle (3R) awareness program can improve the knowledge, attitudes, and practices of the student community towards environmental cleanliness (Anua et al., 2022). While a study from UK showed that lack of recycle facilities influenced knowledge, behavior, and attitude of individual in handling waste so that it pollutes the environment (Northen et al., 2023). Previous study also demonstrates that the transmission of value systems is a recursive and hierarchical process, wherein knowledge influences attitudes, and both attitudes and knowledge mediate activities/practice (Salazar et al., 2022). This study can help to understand how the Zero Waste-Based Plastic Waste Pollution Control Facility can enhance pro-environmental knowledge and behaviour. Understanding public communities' knowledge and behavior of coastal communities in Banyuwangi is expected to provide information to the government that this facility can have a positive effect on the environment.

## 2. Methods

### 2.1. Case of study area

The research was conducted among 636 respondents across four sub-districts in Banyuwangi district (Fig. 1). The sub-district with the highest number of respondents was Muncar, with 260 people (40.88 %), followed by Banyuwangi with 139 people (21.86 %), Kalipuro with 130 people (20.44 %), and Blimbingsari with 107 people (16.82 %).

The waste generated in Banyuwangi Regency in 2022 is 1245 tons per day and could potentially reach 37,360 tons per month. In a year, the waste generated in Banyuwangi reaches 448,330 tons. From that amount, the percentage of organic waste was 66 %, and inorganic waste was 33 % (Waafa and Angin, 2024). This condition was clearly dangerous for the coastal environment. Previous studies stated that the density of macroplastic and mesoplastic waste in July 2020 was 1.96–5.44 waste/m<sup>2</sup> and 0.28–0.80 waste/m<sup>2</sup>, respectively (Nurhayati et al., 2021). Plastic could smother fragile ecosystems such as coral reefs, blocking sunlight and disrupting coral growth, which is crucial for marine biodiversity. The impact of plastic is not only on the coastal environment but also on humans. Previous research showed that 94 % of fish samples contained microplastics. (Sulistyorini et al., 2024). When consumed by humans, microplastics can accumulate in the body and

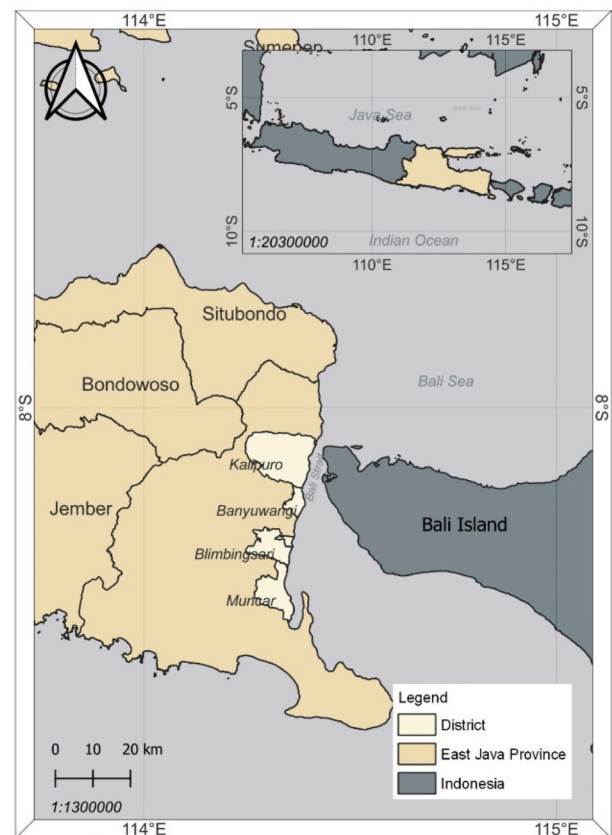


Fig. 1. The research location. The respondents were from the districts of Kalipuro, Banyuwangi, Blimbingsari, and Muncar.

potentially cause damage, including inflammation or potentially toxic effects. To address the plastic waste challenge, the Banyuwangi government provides a Zero Waste-Based Plastic Waste Pollution Control Facility as a plastic waste pollution control (Fig. 2).

The Zero Waste-Based Plastic Waste Pollution Control Facility is a facility designed to manage and reduce plastic waste with a "zero waste" approach. This concept aims to minimize or eliminate the amount of plastic waste discharged into the environment by recycling, reprocessing, or reducing overall plastic consumption (Fig. 3). The facility collects plastic from the ocean and open spaces, including the beaches. Before the establishment of the facility, people processed plastic waste by burnt, buried, or sold to scavengers. Recently, people collect plastic waste from both neighborhoods and households and brought it to the Zero Waste-Based Plastic Waste Pollution Control Facility voluntarily. People who donate plastics are rewarded to encourage them to keep their neighborhood clean. The workers at this facility are local residents who were offered jobs by the Banyuwangi government. The facility works with craftsmen and companies who process the plastics into handicrafts for reuse.

### 2.2. Method of study

This research obtained ethical approval from the research ethic committee of the Faculty of Public Health (Universitas Airlangga, Surabaya, Indonesia) with certificate number 165/EA/KEPK/2023. The questionnaire is used to collect data from respondents, consisting of three parts, namely: (A) Respondent characteristics; (B) Respondent behavior; and (C) Plastic waste control. The respondent characteristics questionnaire included age, gender, education level, type of work, and income. The respondent behavior questionnaire included knowledge, attitudes, and actions of respondents regarding: the dangers of plastic waste, sorting and processing of plastic waste, waste banks, plastic waste



Fig. 2. Zero waste-based plastic waste pollution control facility.

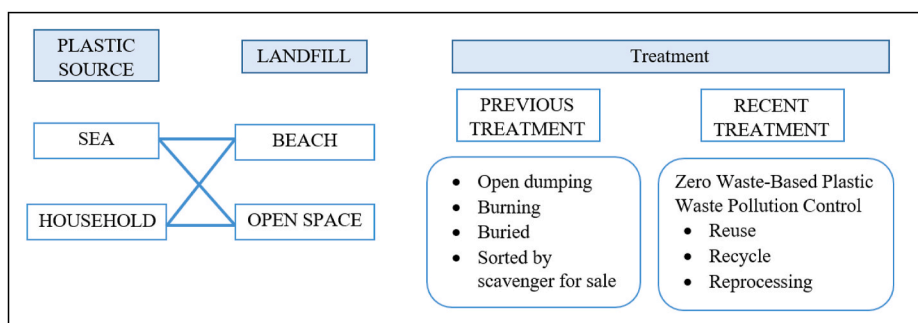


Fig. 3. Plastic waste processing flow in Banyuwangi Regency.

zones, individual and government involvement in plastic waste management, and management through reduce, reuse, and recycle. The plastic waste control questionnaire discussed individual handling in the form of mixing plastic waste and organic waste, disposal of plastic waste into the environment, burning plastic waste, collection of plastic waste and its transportation by scavengers, and collectors of plastic waste scattered in the environment. The potential for plastic waste pollution was measured from the weight of plastic waste produced by respondents in a day, with categories of no potential (plastic waste <30 g) and potential (plastic waste ≥30 g). All data are analyzed using SPSS software. The analysis carried out carried out using statistical tests is simple logistic regression.

### 3. Results

#### 3.1. Respondents characteristics

Table 1 presented the characteristics of respondents in this study based on various variables, such as area of origin, gender, age, number of household members, education level, occupation, and monthly income. The majority of respondents came from Muncar District with the largest percentage, followed by Kalipuro, Banyuwangi, and Blimbing-sari. Respondents are more dominated by men than women. In terms of age, the largest group is those over 50 years old, while the younger age group was decreasing. Most households had 1-5 occupants, while only a small number had more than 5 occupants. The level of education of respondents shows that almost half of them only have basic education or did not attend school, while the rest completed their education up to junior high school and high school level. Most respondents have jobs, with the most common professions being fishermen, freelancers, and self-employed, while more than 43 percent are unemployed. In terms of income, the majority of respondents earned less than 2.5 million rupiah per month, while only a small number have higher incomes.

Fig. 4 illustrated the level of knowledge, attitudes, and actions of the community towards plastic waste in Banyuwangi Regency. The level of knowledge, attitudes, and actions of the community in managing plastic waste varied widely. Some communities had a good understanding of the impact of plastic waste, while others are still less concerned about the environment.

Fig. 5 showed the sources of information used by the community to gain knowledge about plastic waste. The community obtained information about plastic waste from various sources, including social media, formal education, and direct experience. These sources of information played an important role in increasing public awareness of the dangers of plastic waste to the environment and health.

#### 3.2. Plastic waste condition

Fig. 6 shows various types of plastic waste found in this study. The types of plastic waste found in this study included plastic bags, plastic bottles, food packaging, and other types of plastic. The diversity of these types of plastic waste shows the consumption patterns and habits of the community in using single-use plastic.

Table 2 shows the amount of plastic waste produced by respondents in a day and the distribution of respondents based on their potential to pollute the environment with plastic waste. The plastic waste produced by respondents ranged from 0 to 803 g per day, with an average production of 30 g per day. Most respondents produced plastic waste below the average, so it is considered not to have the potential to pollute the environment, while about one-third of respondents produced waste above the average and had the potential to pollute the environment.

Fig. 7 showed the number of plastic bags used by respondents and the reasons behind their use. The number of plastic bags used by respondents varied, with the main reasons for use being convenience, habit, and lack of more environmentally friendly alternatives. High plastic consumption patterns could contribute to the increase in the

**Table 1**  
Characteristics of Respondents in this study.

| No.           | Variable  | Frequency (f)          | Percentage (%) |     |
|---------------|---|------------------------|----------------|-----|
| 1.            | <b>Respondent's District of Origin</b>            |                        |                |     |
|               | Banyuwangi  | 139                    | 21.86          |     |
|               | Blimbingsari                                      | 107                    | 16.82          |     |
|               | Kalipuro  | 130                    | 20.44          |     |
|               | Muncar  | 260                    | 40.88          |     |
| 2.            | <b>Gender</b>                                     |                        |                |     |
|               | Woman   | 167                    | 26.3           |     |
|               | Man   | 469                    | 73.7           |     |
| 3.            | <b>Age (years)</b>                                |                        |                |     |
|               | >50   | 256                    | 40.3           |     |
|               | 40–49   | 178                    | 28.0           |     |
|               | 30–39   | 118                    | 18.6           |     |
|               | 20–29   | 80                     | 12.6           |     |
| 4.            | <b>Number of occupants in the house (/person)</b> |                        |                |     |
|               | 1–5   | 608                    | 95.6           |     |
|               | >5  | 28                     | 4.4            |     |
| 5.            | <b>Education</b>                                  |                        |                |     |
|               | High School/Diploma                               | 160                    | 25.2           |     |
|               | Junior high school                                | 192                    | 30.2           |     |
|               | Elementary school/no school                       | 284                    | 44.7           |     |
| 6.            | <b>Work</b>                                       |                        |                |     |
|               | Not working                                       | 275                    | 43.22          |     |
| 7.            | <b>Type of work</b>                               |                        |                |     |
|               | Laborer   | 73                     | 11.48          |     |
|               | Fisherman   | 103                    | 16.19          |     |
|               | Trader  | 53                     | 8.33           |     |
|               | Private employees                                 | 24                     | 3.77           |     |
|               | Student/Students                                  | 1                      | 0.16           |     |
|               | Junk collector                                    | 2                      | 0.31           |     |
|               | Farmer  | 14                     | 2.20           |     |
|               | Security  | 3                      | 0.47           |     |
|               | Self-employed                                     | 88                     | 13.84          |     |
|               | Doesn't work                                      | 275                    | 43.22          |     |
|               | 8.  | <b>Income (/month)</b> |                |     |
|               |   | >5 million             | 10             | 1.6 |
| 2.5–5 million |   | 82                     | 12.9           |     |
| <2.5 million  |   | 544                    | 85.5           |     |

amount of plastic waste in the environment.

Fig. 8 showed the results of the research in the coastal area of Banyuwangi. The results showed that the control of plastic waste that has been carried out is quite good, with a percentage of 73 %. 25.3 % of plastic waste control is lacking, and the remaining 1.7 % is considered good.

3.3. Correlation of community knowledge and behaviour regarding the potential for plastic waste pollution on the coast of Banyuwangi Regency

Table 3 showed the relationship between the level of knowledge, attitudes, and actions of the community towards the potential for plastic waste pollution on the coast of Banyuwangi Regency. A better level of knowledge tends to be associated with lower pollution potential, although this relationship is not statistically significant. Community attitudes towards plastic waste management also did not show a significant relationship with pollution potential. Likewise, community actions in managing plastic waste did not have a significant correlation with the level of plastic pollution in the coastal environment.

Based on Table 4, it showed that plastic waste control had an influence on the potential for microplastic pollution on the coast of Banyuwangi Regency, with a p-value of 0.000 and a 95 % CI = 1.493–3.296.

4. Discussions

Table 1 showed the characteristics of the respondents. Most of the respondents (40.3 %) were more than 50 years old, with majority of the respondents are male. The majority of them (95.6 %) had 1-5 residents living together under one roof. Up to 44.7 % of respondent education data is from elementary school level of education or no school at all. A similar result was reported by Isa and Zubaidi (2022), where they found that the education level among coastal communities was low. This caused by the economic characteristics of the community are seen from their livelihoods; Among those who were employed, fishermen contributed the biggest portion. Likewise, the socio-economic conditions of local communities tended to have a low level of welfare (Amraeni and Nirwan, 2021). The results of this study are supported by similar research in coastal communities which found that the economic

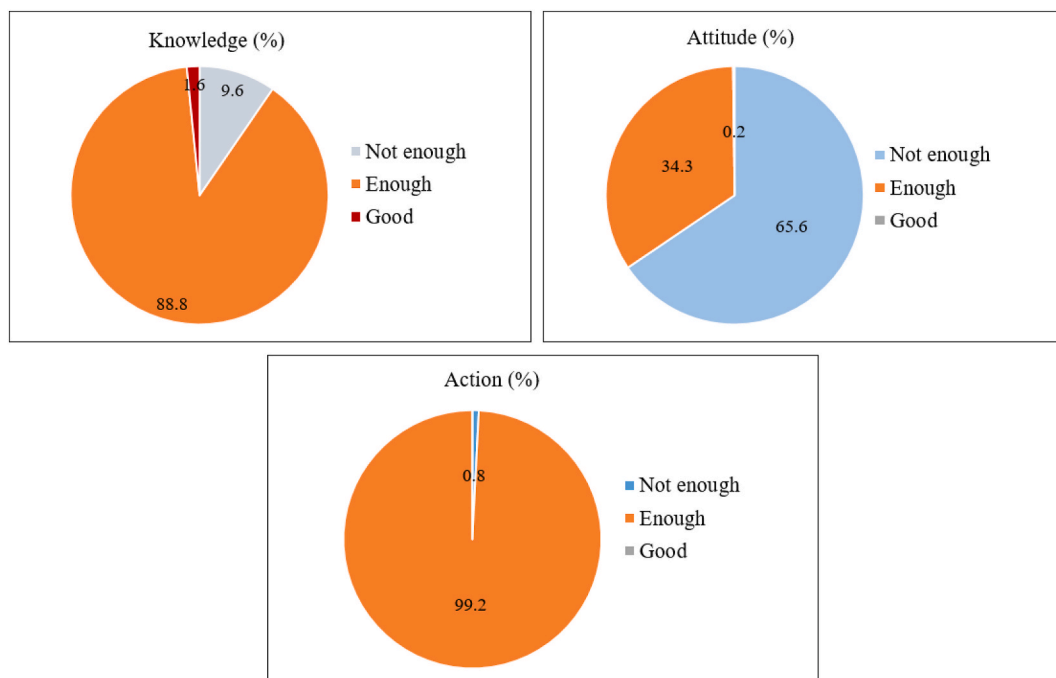


Fig. 4. The community knowledge, attitudes and actions towards plastic waste in Banyuwangi Regency.

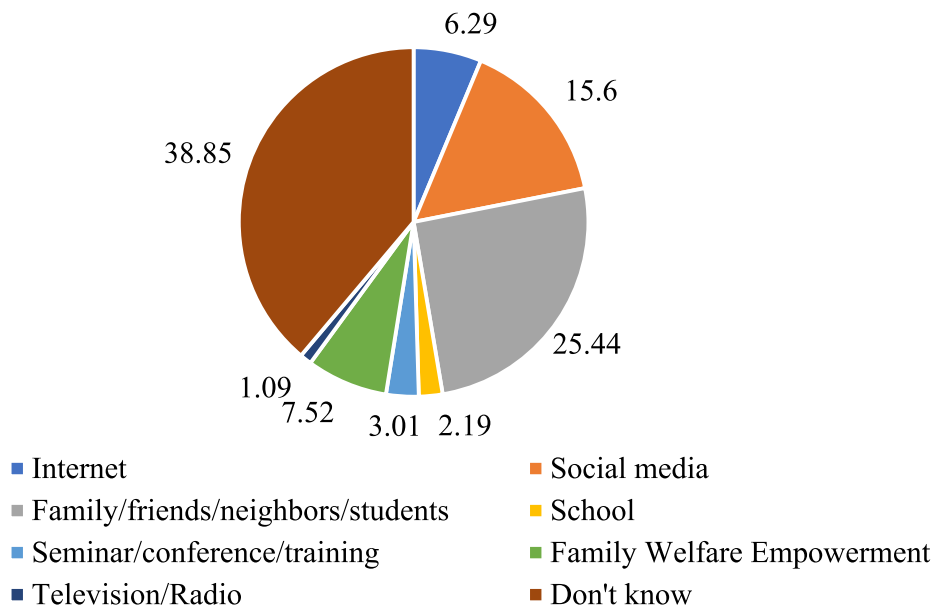


Fig. 5. Sources of information about plastic waste.

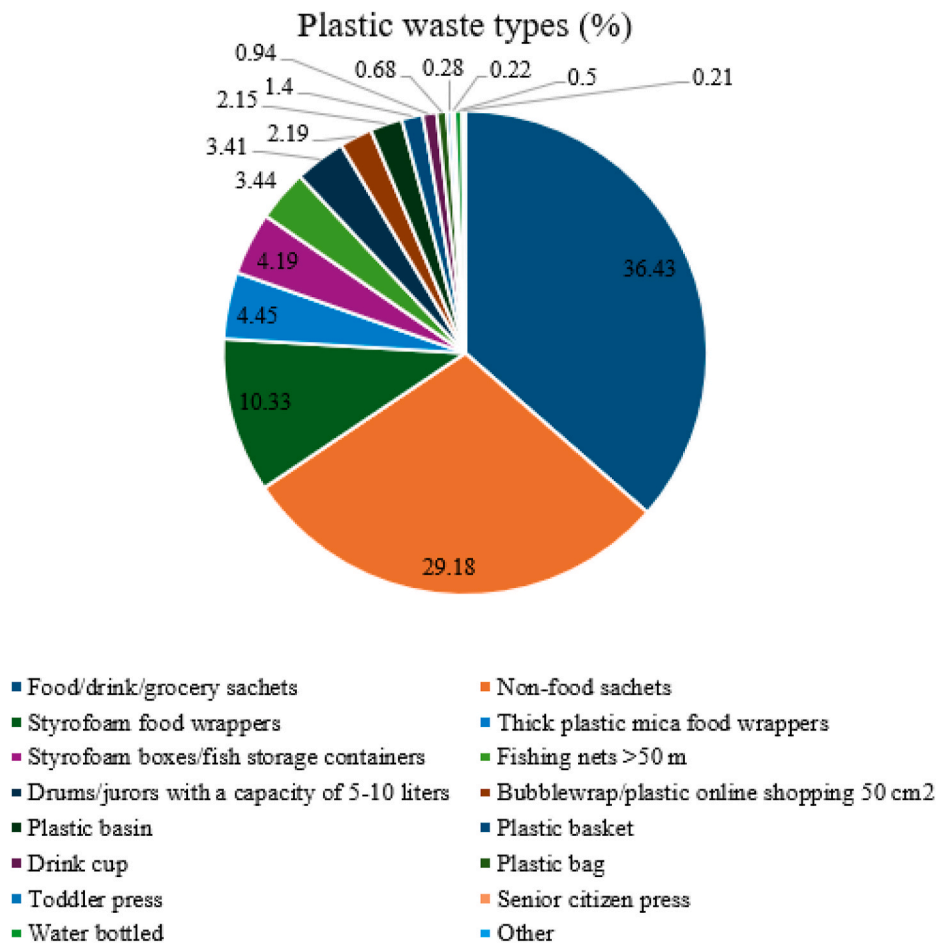


Fig. 6. Plastic waste types found in this study.

characteristics of the community seen from their livelihoods, most of which are working as fishermen have very poor economic conditions or daily income (Fitria et al., 2024). The income of coastal communities is highly dependent on weather, seasons, and fish catches (Isa and Zubaidi,

2022). In addition, they also do not have access to information and skills other than fishing (Isa and Zubaidi, 2022). This condition related to fishermen also occurs in other ASEAN countries such as Thailand, Vietnam, or Malaysia, such as problems of education, poverty, debt, and

**Table 2**  
Weight of plastic waste produced by respondents.

|  |              |
|--|--------------|
| Plastic waste per respondent in a day                          |              |
| Range  | 0–803 g      |
| Average  | 30 g         |
| Number of respondents with heavy plastic waste                 |              |
| Below average (does not have the potential to cause pollution) | 433 (68.1 %) |
| Above average (has the potential to cause pollution)           | 203 (31.9 %) |

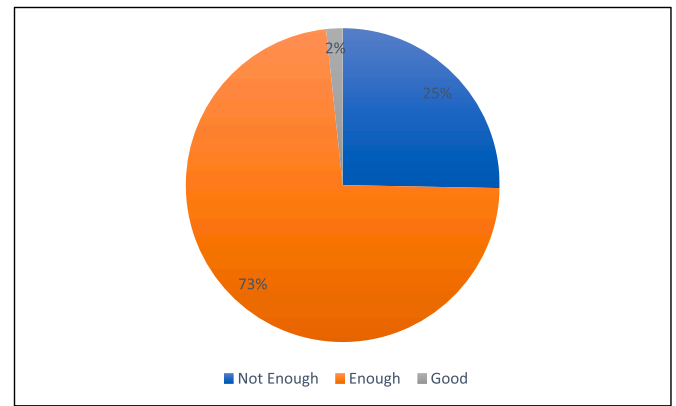
exploitation by middlemen. (Harun et al., 2023; Tran et al., 2023; Subnawin and Singchai, 2024). The local government continues to make efforts to address this issue.

Fig. 4 summarizes the community’s level of knowledge, attitudes, and actions towards plastic waste. It shows that the majority of respondents have sufficient knowledge about waste (88.8 %). This sufficient information is supported by the existence of the Zero Waste-Based Plastic Waste Pollution Control facility in the Coastal Area of Banyuwangi Regency, Indonesia. The existence of this facility is important as it provides job opportunities, programs related to plastic waste recycling, and a source of income from collecting the waste. A previous study stated that good management and facilities for plastic waste at the location would increase the awareness of the community (Herdiansyah et al., 2021).

However, the distribution of respondents’ attitudes towards waste is mostly inadequate (65.6 %). The main challenge of waste management in Banyuwangi lies in the attitude of the community which still needs to be improved. The findings of Setiawati (2023) show that collaboration between traditional leadership and government in Sanur, Bali, has succeeded in increasing community participation in waste management. Banyuwangi can apply a similar approach by involving traditional leaders, such as senior fishermen, in the socialization and education process.

Meanwhile, the majority of respondents’ actions in managing waste were sufficient (99.2 %). A previous study stated that attitudes may not always lead to behaviors or actions since behaviors are affected by many other factors (Tang, 2023). A study in the Shanghai district stated that despite having a negative attitude towards plastics, knowledge of microplastics in the environment and their impacts on life influenced the behavior of the community (Deng et al., 2020).

Disseminating information about plastic waste pollution is one of the important things in increasing the knowledge, attitudes, and actions of local communities. Sources of public information about plastic waste can be seen in Fig. 5. The results showed 38.85 % of respondents did not know any information about plastic waste. The challenge in disseminating information about plastic waste also needs special attention. The findings of Antin et al. (2017) show that the use of a combination of official and unofficial communication channels, such as social media and educational programs, has proven to be more effective in increasing public awareness of the importance of waste management. These findings are an important basis for Banyuwangi in designing a more



**Fig. 8.** Control of plastic waste using Zero Waste-Based Plastic Waste Pollution.

inclusive communication strategy that can reach all levels of society.

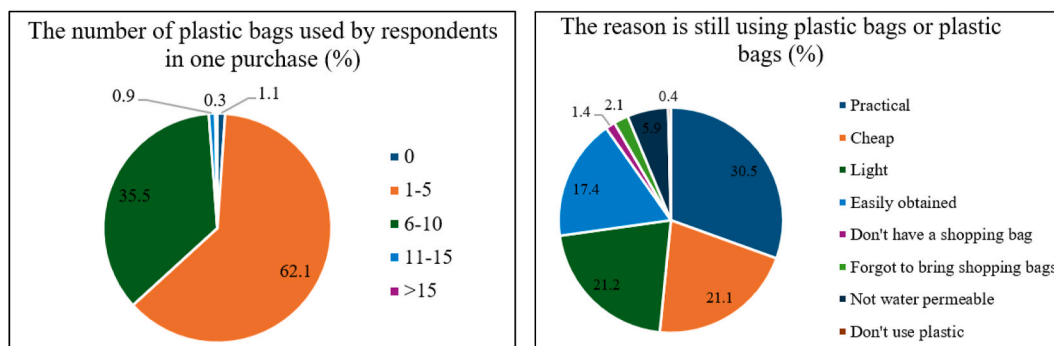
In addition, coastal areas are not easily accessible to outsiders (Wijayanti, 2021). In fact, not all coastal communities in Banyuwangi have access to the internet, social media, and TV (Pahlevi and Jauhar-iyah, 2022). In addition to remote areas, the community’s economy also limited their access to sources of information.

This study revealed several types of plastic waste found on the beach and in households (Fig. 6). The types of plastic waste commonly found were food/drink/grocery sachets (36.43 %), non-food sachets (29.18 %), styrofoam food wrappers (10.33 %), thick plastic mica food

**Table 3**  
The influence of community knowledge, attitudes and actions on the potential for plastic waste pollution on the coast of Banyuwangi Regency.

| No. | Variable         | Potential plastic waste pollution |           | Total | P value | 95 %CI      |
|-----|------------------|-----------------------------------|-----------|-------|---------|-------------|
|     |                  | No potential                      | Potential |       |         |             |
| 1.  | <b>Knowledge</b> |                                   |           |       | 0.059   | 0.981–2.968 |
|     | Not enough       | 48                                | 13        | 61    |         |             |
|     | Enough           | 379                               | 186       | 565   |         |             |
|     | Good             | 6                                 | 4         | 10    |         |             |
| 2.  | <b>Attitude</b>  |                                   |           |       | 0.502   | 0.797–1.591 |
|     | Not enough       | 287                               | 130       | 417   |         |             |
|     | Enough           | 146                               | 72        | 218   |         |             |
|     | Good             | 0                                 | 1         | 1     |         |             |
| 3.  | <b>Action</b>    |                                   |           |       | 0.999   | 0,000       |
|     | Not enough       | 5                                 | 0         | 5     |         |             |
|     | Enough           | 428                               | 203       | 631   |         |             |

Statistical analysis: simple logistic regression, Significant at p < 0.05.



**Fig. 7.** The number plastic bags used by respondents and the reasons.

**Table 4**

Effect of plastic waste pollution using Zero Waste-Based Plastic Waste Pollution Control facility on the potential for plastic waste pollution on the coast of Banyuwangi Regency.

| No. | Variable                     | Potential plastic waste pollution |           | Total | P value | 95 %CI      |
|-----|------------------------------|-----------------------------------|-----------|-------|---------|-------------|
|     |                              | No potential                      | Potential |       |         |             |
| 1.  | <b>Plastic waste control</b> |                                   |           |       |         |             |
|     | Not enough                   | 127                               | 34        | 161   | <0.001  | 1.493–3.296 |
|     | Enough                       | 303                               | 161       | 464   |         |             |
|     | Good                         | 3                                 | 8         | 11    |         |             |

Statistical analysis: simple logistic regression.

wrappers (4.45 %), styrofoam boxes/fish storage containers (4.19 %), fishing nets >50 m (3.44 %), drums/jurors with a capacity of 5–10 L (3.41 %), bubble wrap/plastic online shopping 50 cm<sup>2</sup> (2.19 %), plastic basins (2.15 %), plastic baskets (1.4 %), drink cups (0.94 %), plastic bags (0.68 %), water bottles (0.5 %), toddler presses (0.28 %), senior citizen presses (0.22 %), and other (0.21). The waste found on the beach mostly from tourism activities. Coastal areas, in general, are potential areas to be developed as tourism areas. However, due to the increase in tourist activities, including trade, diving, sunbathing, hotels, etc., they impose an impact by increasing the plastic waste (Ashuri and Kustiasih, 2020). On the other hand, households are also contributing to plastic waste in coastal areas, as reported in Nairobi, Kenya (Oguge et al., 2021).

The potential for plastic waste pollution could be seen from the weight of plastic waste produced by respondents in a day (Table 2). Plastic wastes generated by a respondent in a day range between 0 and 803 g, with an average of 30 g. The percentage of respondents with heavy plastic waste below average was bigger (68.1 %) as compared to those with above average (31.9 %). The amount of plastic used is relatively small because there are already regulations from the government regarding the limit of plastic waste (Putri, 2019).

The research also identified the amount of plastic used by the community in one purchase (Fig. 7). Most of the respondents (62.1 %) stated that the number of plastic bags used for shopping is 1–5 bags as compared to those who used 6 to 10 plastic bags (35.5 %) in one shopping trip. The amount of plastic used is relatively small because there are already regulations from the government. As the government attempted to deal with the use of plastic waste, a policy has been issued that limits the use of plastic. The following regulations related to waste management in Indonesia are: (1) Presidential Regulation Number 83 of 2018 concerning Handling of Marine Waste; and (2) Presidential Regulation Number 97 of 2017 concerning National Waste Management Policy and Strategy. However, the use of plastic bags is still common in many countries such as India, Bangladesh, and Saudi Arabia because they are cheap and practical (Jalil et al., 2013; Alteneji et al., 2024).

The influence of the Zero Waste-Based Plastic Waste Pollution facility in controlling the distribution of unwanted plastics in the environment is shown in Fig. 8. The community response (73 %) shows that the facility gives enough influence in controlling the plastic waste. This finding indicates that more effective collaboration is needed between the management of Zero Waste-Based Plastic Waste Pollution facilities and the community. In waste management, collaboration is required to produce optimal effects for society. A previous study done at Ketapang Village explained that a pattern of relationships has been formed with several stakeholders, including academics, the Banyuwangi Regency government, the DLH Regency, business people, the community, and the mass media. The results of this collaboration had a good impact on the environment, namely controlling and managing waste, as well as supporting other sectors with new tourism and the community's economy also increased (Ningrum et al., 2023).

One form of collaboration between local governments and the private sector is the collaboration between PT Sistemiq Lestari Indonesia,

which is running the STOP (Stopping Ocean Plastic) program, with the aim of reducing and overcoming environmental pollution due to waste thrown into the sea, especially in the village of Wallingrejo, Muncar District, Banyuwangi Regency. One concrete form of activity carried out is the 3R Integrated Waste Management Site (TPST), where the community's role starts from sorting waste from home, participating in socialization on waste management, and agreeing on a waste levy system (Farah et al., 2022).

Waste management at TPST 3R Wallingrejo has an institution run by the Bio Mandiri Lestari Community Self-Help Group (KSM). In terms of financing, the source of operational costs in implementing waste management came from community contribution funds, sales income from compost and BSF fly larvae, and the existence of APBN village funds. Meanwhile, technically operational processes are carried out starting from containerization, waste collection, reception, processing (differentiated between inorganic and organic waste), transportation, and final processing at the Tegalwero TPA (Kartika and Puspikawati, 2021).

Statistical analysis was conducted to determine the potential influence of plastic waste pollution on the knowledge and behavior of coastal communities in Banyumas Regency. The results in Table 3 showed no significant correlation observed between the studied variables. The results of previous research in Batu Pahat, Johor, Malaysia, found that there were several factors that influenced an individual's intention to reduce the use of single-use plastic, including attitudes, social pressure, and the perceived behavioral control of the individual (Van et al., 2021). These results indicated that the knowledge, attitude, and action of the community of Banyuwangi Regency no longer caused potential plastic waste pollution. This is considered due to the influence of the Zero Waste-Based Plastic Waste Pollution facility. The facility provides job vacancies, programs related to plastic waste recycling, money from collecting the waste, and a clean environment. This case also occurred in Semarang City (Indonesia), which has a Community-driven material recovery facility (CdMRF) that increases incomes within their community and created a clean environment. Therefore, it is accepted by the community (Budihardjo et al., 2022).

The strategy that must be implemented to increase public awareness of the impact of single-use plastics on the environment is by providing incentives for using reusable plastic bags, promoting public awareness, carrying out advocacy related to marine environmental problems from single-use plastics, and further investigating the potential for a plastic ban (Lange et al., 2021). Also, social media can be used to reach the public to increase public awareness, such as Instagram, Twitter, Facebook, Pinterest, Tumblr, and others, like in Sri Lanka (Arulnayagam, 2020). The same method was done in Kenya, where the use of social media and radio was considered capable of disseminating information regarding the impact of plastic on the environment and human health. The most preferred social media platforms were WhatsApp (31 %) and YouTube (29 %) (Oguge et al., 2021).

Based on Tables 4 and it shows that controlling plastic waste using the Zero Waste-Based Plastic Waste Pollution facility has an influence on the potential for plastic pollution on the coast of Banyuwangi Regency, with a p-value of <0.001. The use of single-use plastics causes the accumulation of plastic in the environment, especially the presence of plastic waste in the sea that knows no boundaries.

To strengthen the implementation of the Zero Waste program in Banyuwangi, the local government needs to hold comparative dialogues with other regions in Indonesia that have implemented similar policies. The study by Budihardjo et al. (2022) shows that a community-based approach through the Community-driven Material Recovery Facility (CdMRF) in Semarang, accompanied by economic incentives, can increase community participation. Meanwhile, the single-use plastic ban policy implemented by the Bali regional government, as studied by Putri (2019), with the support of strict sanctions, has proven successful in reducing plastic waste generation. This comparison shows that Banyuwangi needs to combine the two approaches by not only relying on Zero Waste facilities, but also strengthening regulatory and law enforcement

aspects.

At the global level, the Banyuwangi government can enrich its waste management strategy by integrating the latest technology. In their study, [Nikiema and Asiedu \(2022\)](#) recommend the use of 'sea bins', which are floating trash bins that can capture 2 mm microplastics in coastal waters, and this solution has proven effective in cleaning up marine debris in several countries. In addition, the circular economy approach proposed by [Kumar et al. \(2021\)](#) offers a business model that converts plastic waste into products of economic value through collaboration with local industries, thereby increasing the income of coastal communities while reducing waste leakage into the sea.

This study had several limitations that needed to be considered, including that the data collected is quantitative and questionnaire-based, which could cause bias in respondent responses due to subjective factors or a lack of understanding of the questions. This is because the coastal community has less education (44.7 % of people were elementary school graduates/no school). Education is one of the important factors in understanding a problem ([Bellaera et al., 2021](#)). However, researchers in this study tried to explain and accompany all individuals throughout the research process, including data collection.

Also, this study did not explore in depth the social and economic factors that could influence community behavior in managing plastic waste. Previous study stated that social factor like age, gender, and postcode and economic factor such as income, education, living situation, and vehicle ownership also affected the attitudes of community toward plastics in UK ([Northen et al., 2023](#)). As example, that study showed that 85 % of respondents aged 51 years and above purchased zero plastic bags in an average week, compared to 39 % of the youngest age group ( $\leq 30$  years) so older communities are more aware that plastic is harmful to the environment even though facilities are limited ([Northen et al., 2023](#)). A study in Malaysia also indicated that individuals who are older, have a higher level of training, and have higher incomes recycle more than others ([Afroz et al., 2017](#)). Further research would be better to identify more completely the social and economic demographics related to the existence of Zero Waste-Based Plastic Waste Pollution Control facilities against community's knowledge and behaviour. Despite its limitations, this study also had several advantages. One of them is an in-depth analysis of the relationship between community knowledge, attitudes, and actions in managing plastic waste and its potential for pollution. In addition, this study is one of the studies that assesses the concrete impact of Zero Waste-Based Plastic Waste Pollution Control facilities in the context of plastic waste management in coastal areas. The results of this study could be a reference for local governments and policymakers in designing more effective waste management strategies based on community participation.

This study provides a marginal theoretical contribution by integrating local findings on plastic waste management into a global framework. This study specifically tests the effectiveness of the Zero Waste approach in coastal communities with low levels of education, where 44.7 % of respondents only have elementary school education or no schooling. The results of the study strengthen the circular economy theory ([Kumar et al., 2021](#)) by showing that incentive-based facilities such as the Community-driven Material Recovery Facility (CdMRF) in Semarang ([Budihardjo et al., 2022](#)) have a greater impact than simply increasing community knowledge (88.8 % have sufficient understanding but 65.6 % have poor attitudes). These findings fill the gap in the literature on the knowledge-action gap ([Salazar et al., 2022](#)) in the context of developing countries. In addition, this study recommends the implementation of integrated policies that combine top-down approaches such as plastic bans with bottom-up approaches through community collaboration to achieve Sustainable Development Goal (SDG) 14.

## 5. Conclusion

This study showed that Zero Waste-Based Plastic Pollution Control

facilities had a positive effect on reducing the potential for plastic waste pollution on the coast of Banyuwangi Regency. However, although the community had a sufficient level of knowledge about plastic waste management, their attitudes and actions still needed to be improved to be more consistent in supporting waste reduction efforts. There is no significant relationship between the level of knowledge and community actions towards potential pollution, but Zero Waste-based waste management facilities have proven effective in reducing plastic pollution. Therefore, it is important for the government and stakeholders to continue to expand these facilities and increase public awareness through education and stricter policies. With synergy between the community, government, and the private sector, plastic waste management in coastal areas could be improved sustainably.

## CRedit authorship contribution statement

**Lilis Sulistyorini:** Validation, Data curation, Writing – original draft, Formal analysis, Methodology, Conceptualization. **Muyassar Hamid Abualreesh:** Resources, Supervision, Validation, Project administration. **Mohamed Ahmed Ali Abu El- Regal:** Visualization, Project administration, Resources, Validation. **Saliza Mohd Elias:** Writing – review & editing, Methodology, Validation. **R. Azizah:** Investigation, Supervision, Writing – original draft, Data curation. **Leka Lutpiatina:** Data curation, Methodology, Writing – review & editing. **Novi Dian Arfiani:** Writing – original draft, Data curation, Project administration, Visualization. **Muhammad Addin Rizaldi:** Writing – review & editing, Project administration, Visualization. **Ratih Zahratul Jannah:** Visualization, Methodology, Software. **Muhammad Browjoyo Santanunurti:** Visualization, Software, Validation.

## Disclosure statement

This research was showed that with an analysis of Zero Waste-Based Plastic Waste Pollution Control in the Coastal Area of Banyuwangi Regency, Indonesia, it is an implementation of the 14th Sustainable Development Goals (SDG's), which aims to preserve and sustainably utilize marine and ocean resources for sustainable development.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.indic.2025.100773>.

## Data availability

No data was used for the research described in the article.

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