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# Coastal Community Perspectives: Knowledge, Attitudes, and Practices (KAP) on Marine Plastic Pollution among Coastal Residents in Tangub City, Misamis Occidental, Philippines

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## ABSTRACT

Marine plastic pollution has become an emerging environmental problem, particularly in tropical archipelagos like the Philippines. The study investigated the knowledge, attitude, and practices among coastal communities towards marine plastic litter in Tangub City, Misamis Occidental. The study utilized the quantitative-correlational research design. A total of 352 random respondents were selected from the 5 coastal barangays with the most household numbers in the city. Data were collected through an adapted survey questionnaire and analyzed using descriptive and inferential statistics. The results revealed that majority of the respondents were women (52%), married (61%), and aged 41 to 50 years old (25%). Moreover, the educational attainment of most respondents were high school level (32%) with income below P5,000 (83%), primarily fishermen (43%) that had lived in the area for 20 years and above (62%). Overall, the respondents have a very high level of knowledge, attitudes, and practices. Further analysis showed that respondents' knowledge significantly differs by educational attainment while attitude also showed a significant difference across age groups. However, respondents' practices on MPL have no significant difference when grouped by socio-demographic profile. Lastly, the knowledge revealed a weak positive correlation to the attitudes and practices of the respondents. The study recommends that a comprehensive approach combining education, stricter enforcement, improved infrastructure, and active community involvement is necessary to address Tangub City's plastic waste problem effectively.

**Keywords:** Knowledge; Attitude; Practices; Marine plastic litter; Coastal community; Macro-plastics.

## 1. INTRODUCTION

Marine plastic pollution is an emerging major environmental crisis (Galicia *et al.* 2023), affecting coasts and coastlines worldwide (Williams and Rangel, 2019). Plastics are widely produced due to their exceptional qualities, such as hardness, lightness, elasticity, transparency, and durability (Ivleva *et al.* 2017). Although plastic offers convenience, its widespread use comes at a significant environmental cost (Geyer *et al.* 2017). In 2015, 381 million metric tons of plastic were produced globally with a larger portion eventually ending up in our oceans (Geyer *et al.* 2017) because of the rising plastic manufacture, widespread use, and inadequate plastic waste management (Rochman, 2015). In every 67.5 million metric tons of plastic waste, it was estimated that 1 million metric tons of it will enter the ocean every year (Meijer *et al.* 2021). Since then, plastic waste has caused worldwide concern that poses a significant threat to marine ecosystems, human health, and the economic well-being of coastal communities (Jambeck *et al.* 2015).

Marine plastic pollution is particularly prevalent in tropical archipelago regions, like the Philippines, because of their higher waste emission due to their relatively small geographical area compared to the length of their coastline, high precipitation rates, and poor waste management systems, which increase the probability of plastic waste to be washed into the ocean (Meijer *et al.* 2021). The Philippines is an archipelagic nation with a coastline stretching over 35,000 kilometers, wherein approximately 60% of the country's population lives along the coast and its shoreline. It was considered that one of the main sources of marine plastic pollution is land-based plastics (Li *et al.* 2016), either by direct emission from coastal areas (Jambeck *et al.* 2015) or by transport through rivers (Lebreton *et al.* 2017; Schmidt, 2017). In 2010, the country ranked third in total land-based plastic waste input that enters the ocean, contributing 0.28-0.75 million metric tons of plastic waste every year (Jambeck *et al.*, 2015). Just recently, in the study of Meijer *et al.* (2021), the Philippines ranked as the number one polluter of plastic from rivers to the

ocean with 4820 rivers, emitting an annual estimation of 356,371 metric tons of plastic waste, followed by India and then Malaysia.

Now, more than 5 trillion plastic pieces are floating in the world's oceans which poses a significant threat to marine life and its natural resources (Eriksen *et al.* 2014). This plastic waste comes from various sources, such as packaging, textiles, fishing nets, nylons, and aquaculture activities (Desforges *et al.* 2015; Van *et al.* 2015). Over time, these larger plastics will undergo degradation and fragmentation that will result in the creation of secondary microplastics that are undetectable to the human naked eye (Arthur *et al.* 2009). Plastic debris endangers marine life through entanglement, ingestion, and habitat destruction, and accumulates in coastal areas (Napper and Thompson, 2020). This enormous amount of plastic debris in the ocean has harmed or killed countless marine life, affecting their survival and leading to potential extinction and degradation of marine resources that affect people who rely on it (Derraik *et al.* 2002).

Coastal communities are particularly vulnerable to plastic pollution due to their proximity to the ocean. Tangub City, nestled along the picturesque coastline of Northern Mindanao in the Philippines, has a rich marine ecosystem that sustains its tourism industry and local fisheries. However, this natural beauty is increasingly marred by the growing environmental threat of plastic pollution. Plastic debris accumulates on Tangub City's coast, threatening its marine life and hindering its tourism potential. The city's fisheries, the sources of livelihood for many residents, are also at risk from plastic pollution.

One way of protecting and conserving our oceans and marine resources from plastic pollution is to develop and enforce plastic regulation policies (Galarpe *et al.* 2021). However, the creation of policies and solutions to address plastic pollution should be localized because the status of this problem differs in every coastal community and one regulation may not be applicable in a specific locality. These localized and data-driven policies should underscore the importance of understanding the knowledge, attitudes, and practices among coastal residents in tailoring effective interventions to solve marine plastic pollution in the city. Anent to this, no study was ever made in the locality of Tangub City.

Therefore, this study aims to investigate the knowledge, attitudes, and practices of coastal communities towards marine plastic pollution in Tangub City, Misamis Occidental, Philippines. The specific objectives of the study are (1) to determine the knowledge of coastal communities on marine plastic litter, (2) to assess the attitudes of coastal communities towards marine plastic litter, (3) to investigate the practices of coastal communities on plastic waste management, (4) to evaluate the significant difference of coastal community's socio-demographic profile to their knowledge, attitude, and practices towards marine plastic litter, and (5) to test the significant relationship of coastal community's knowledge on marine plastics to their attitudes and practices towards littering and management.

## 2. MATERIALS AND METHODS

### 2.1 Research Design

In this study, the correlational type of quantitative research design was applied to investigate the association of knowledge, attitudes, and practices of the respondents on marine plastic. Moreover, this research design was also employed to determine the significant difference in the respondents' knowledge, attitude, and practices with the socio-demographic profile as the grouping variable.

### 2.2 Location of the Study

Misamis Occidental is a province located in the northern part of Mindanao. It is separated from Lanao del Norte by Panguil Bay to the south, from Misamis Oriental by Iligan Bay to the east, by Mindanao Sea in the northeast, and bordered by Zamboanga del Norte and Zamboanga del Sur in the west. Tangub City is one of the three (3) component cities in the province of Misamis Occidental. It is a coastal component city that is geographically situated at approximately 8° 3' 39" North, 123° 45' 5" East. The city has a total land area of 162.78 square kilometers, comprising 55 barangays, and 15 of them are coastal barangays due to its proximity to Panguil Bay in the South. Specifically, this study was conducted in the top 5 most populated coastal barangays of Tangub City in terms of household numbers, including barangay Maquilao, Pangabuan, Maloro, Migcanaway, and Lorenzo Tan (Figure 1).

### 2.3 Respondents of the Study

The respondents of the study were the coastal resident, who is the head of the households in the selected 5 coastal barangays in Tangub City. Out of 352 total respondents, 88 were from barangay Maquilao, 74 were from barangay Pangabuan, 68 respondents from barangay Maloro, followed by 66 respondents from barangay Migcanaway and 56 were from barangay Lorenzo Tan. The sample size was calculated based on the formula of Yamane (1967).

$$n = \frac{N}{1+(Ne^2)} \quad \ldots (1)$$

n = sample size
N = total population
e = margin of error (0.05)

Since the household numbers per barangay are uneven, a proportional allocation formula was used to ensure an appropriate number of respondents per barangay.

$$n_i = \frac{N_i}{N} x\, n \qquad \ldots (2)$$

$n_i$ = sample size of each stratum
$N_i$ = population size for a stratum
N = total population
n = total sample size calculated

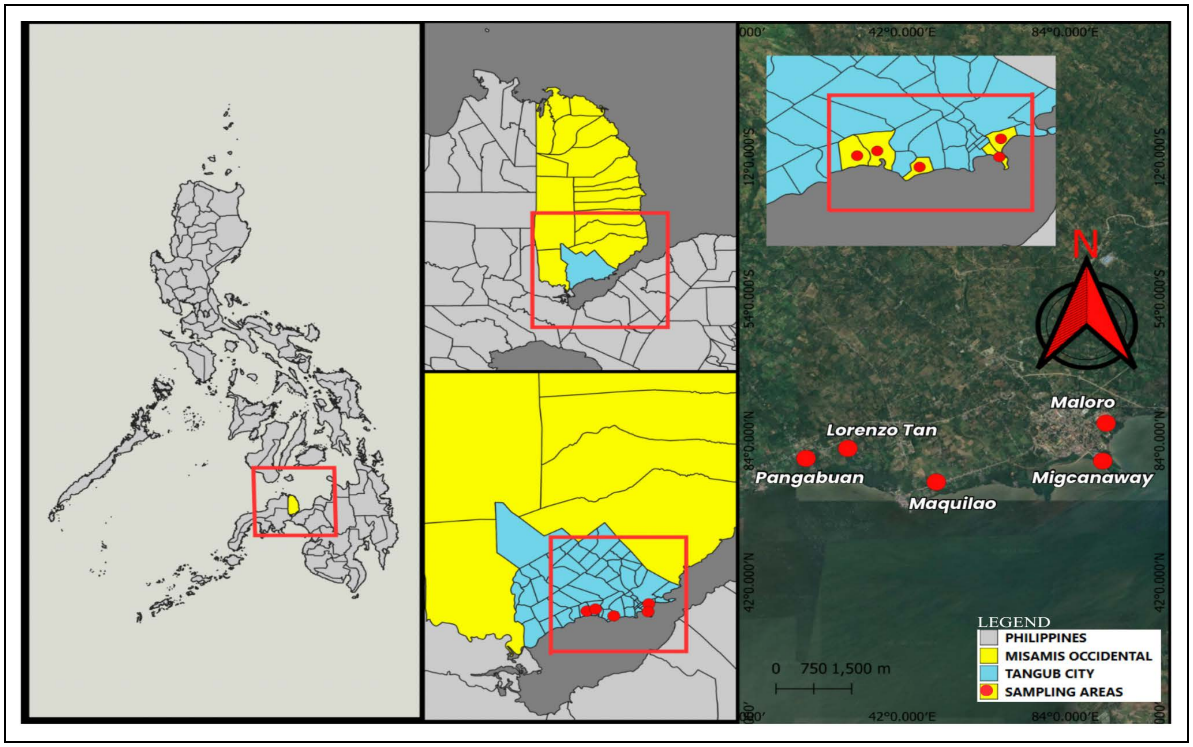



**Fig. 1: Map of the study sites showing five sampling locations**

## 2.4 Data Collection

Before the collection of all essential data, approved consent letters from concerned individuals were first secured. Simple random sampling was employed to choose the target respondents in the entire population. The questionnaire was adapted from the PROMAR BlueBox KAP survey with minor modifications. The questionnaire was divided into four parts:

(1) The socio-demographic profile of the respondents

(2) the coastal community's level of knowledge on marine plastic litter,

(3) Attitudes towards marine plastic litter

(4) Practices of the coastal community on plastic waste management

A four-point Likert scale was used to analyze the data. Responses to the statements were coded as follows:

| | | | | |
|---|---|---|---|---|
| Level of knowledge | Strongly agree = 4 | Agree = 3 | Disagree = 2 | Strongly disagreed = 1 |
| Level of attitudes | | | | |
| Level of practices | Always = 4 | Often = 3 | Rarely = 2 | Never = 1 |

## 2.5 Data Analysis

The gathered data were analyzed quantitively using Jamovi ver. 2.3.28. Descriptive statistics such as frequency and percentage were utilized to describe the respondents' profiles. Median was used to determine the knowledge, attitudes, and practices of coastal communities towards marine plastic litter. Inferential statistics such as the Kruskal-Wallis Analysis were employed to evaluate the significant difference in coastal community's socio-demographic profile and their knowledge, attitude, and practices towards marine plastic

litter. If there is a significant difference, a pairwise comparison was further tested by Dwass-Steel-Critchlow-Flinger (DSCF) to assess which variables caused the difference. Lastly, the Spearman correlation was used to test the association of coastal communities' Knowledge, Attitudes, and Practices on marine plastic pollution.

**Table 1. Frequency distribution of respondents' socio-demographic profile**

| Socio-demographic Variables | | Frequency | Percentage |
|---|---|---|---|
| Gender | Female | 182 | 52 |
| | Male | 170 | 48 |
| Age | Below 15 years | 3 | 1 |
| | 16-20 years | 0 | 0 |
| | 21-30 years | 67 | 19 |
| | 31-40 years | 75 | 21 |
| | 41-50 years | 87 | 25 |
| | 51-60 years | 74 | 21 |
| | 61 years and older | 46 | 13 |
| Civil Status | Single | 55 | 16 |
| | Married | 213 | 61 |
| | Live in | 48 | 14 |
| | Separated | 11 | 3 |
| | Widow | 25 | 7 |
| Educational Attainment | Elementary level | 55 | 16 |
| | Elementary graduate | 32 | 9 |
| | High school level | 112 | 32 |
| | High school graduate | 64 | 18 |
| | College level | 67 | 19 |
| | College Graduate | 22 | 6 |
| Monthly Income | Below ₱ 5,000 | 291 | 83 |
| | ₱5,001 - ₱ 10,000 | 43 | 12 |
| | ₱ 10,001 - ₱ 15,000 | 12 | 3 |
| | ₱ 15,001 and above | 6 | 2 |
| Source of Income | Government employee | 15 | 4 |
| | Private employee | 7 | 2 |
| | Fisherman | 150 | 43 |
| | Vendor | 74 | 21 |
| | Housewife | 40 | 11 |
| | Driver | 22 | 6 |
| | Others (Labor, Senior Citizen, Manicurist) | 44 | 13 |
| Years of Residency | Less than 5 years | 40 | 11 |
| | 5-10 years | 42 | 12 |
| | 11-15 years | 34 | 10 |
| | 16-20 years | 18 | 5 |
| | 20 years and above | 218 | 62 |

## 3. RESULTS AND DISCUSSION

### 3.1 Respondent's Socio-demographic Profile

Table 1 depicts the socio-demographic profile of the respondents. Most respondents were women (52%), while the rest were men (48%). Age ranged 41-50 years old dominated with 25%. In addition, the majority of the respondents were married (61%), followed by those who were single (16%), and the least were those who were separated (3%).

Moreover, high school level (32%) is the major educational background, followed by college

level (19%), while only a few of them were college graduates (6%). Furthermore, approximately 83% of the participants have an estimated monthly income of PHP below 5,000. Fishermen are the highest source of income (43%) among most respondents who have 20 years and above of residency (62%) in the coastal community of Tangub City.

### 3.2 Respondents' Knowledge of Marine Plastic Litter

Figure 2 highlights the respondents' knowledge of marine plastic litter. A significant portion of the respondents were cognizant of the policies and ordinances implemented in the city to prevent plastic litter (yes=99%). Additionally, 94% of respondents acknowledged that plastic waste management is a significant issue in their community. Despite the existing relevant laws, enforcement remains weak due to a lack of willingness among residents to report violators to local authorities. This observation aligns with the study by Charitou *et al.* (2021), which found strong agreement that plastic pollution is a major environmental issue.

However, 58% of the respondents were unaware of microplastics and where it comes from (no=58%). The study of Charitou *et al.* (2021) further supports that knowledge of microplastics is significantly lacking among the participants. Awareness of this matter is therefore necessary. Moreover, some of the respondents were unsure or didn't consider marine plastic litter as a problem for them and the community. The respondents were uncertain about this statement because for them, they are always exposed to this problem and they don't mind this anymore.

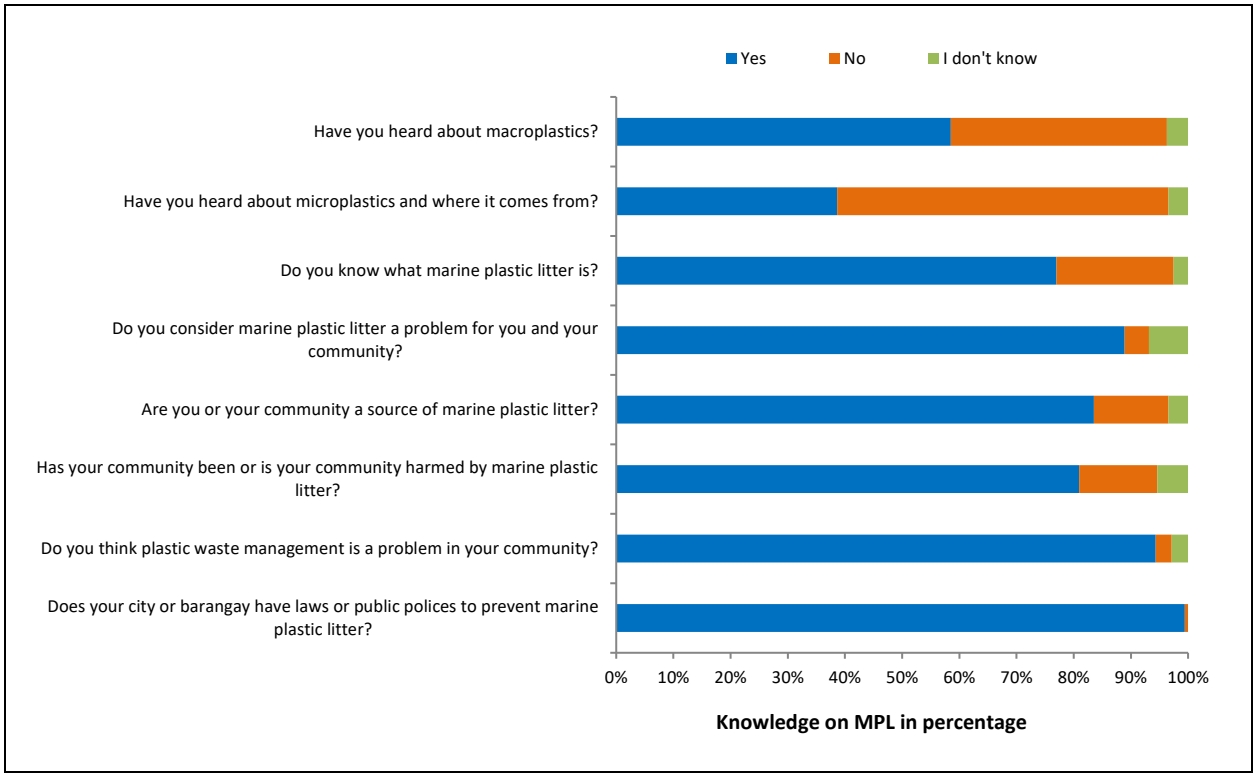



**Fig. 2: Coastal community's knowledge of marine plastic litter in percentage**

### 3.3 Level of Knowledge on Marine Plastic Litter (MPL)

Table 2 provides a comprehensive assessment of the level of knowledge of the coastal community regarding the impact of marine plastic on the environment and human health. The overall level of knowledge among respondents was very high, with an overall median score of 4.00 (Strongly Agree). The highest median score (4.00) is attributed to the understanding that plastic waste negatively affects the environment throughout its lifecycle. Similarly, the harmful effects of incinerating plastic on human health (4.00) and the persistence of plastic in the ocean (4.00) were also well-recognized by the respondents. These findings reflect that the respondents were truly experiencing the negative impacts of marine plastic pollution in the area and on one's health when plastic was burned. According to Hidalgo-Ruz *et al.* (2012), many communities are aware that plastic waste has negative

effects, and its degradation is extremely slow. Moreover, marine plastic litter was acknowledged for its detrimental impacts on ecosystems (4.00), livelihoods, and tourism (4.00), and there was a strong knowledge that plastic litter on land would eventually reach the ocean (4.00). The long decomposition times for plastic bags (20 years), bottles (450 years), and fishing lines (600 years) were also widely understood. There was a significant awareness that marine plastic can break down into microplastics (4.00) and marine organisms ingest plastic waste (4.00). The respondents shared their sentiments that marine plastic pollution extremely affects the ocean because it has a longer rate of decomposition and continuously breaks into smaller fragments. Agreeing with the fishermen's responses, these fragmented plastics were ingested by marine organisms and will eventually impact their fishing livelihood.

**Table 2. Level of knowledge on Marine Plastic Litter**

| Statement | Median Score | Level of Knowledge |
|---|---|---|
| Plastic waste has a negative effect on the environment at every stage of its lifecycle. | 4.00 | Strongly Agree |
| Incineration or burning plastic waste affects human health. | 4.00 | Strongly Agree |
| Marine plastic litter causes harmful effects on marine ecosystems. | 4.00 | Strongly Agree |
| Marine plastic litter negatively affects fishing livelihood and tourism fortunes like beaches. | 4.00 | Strongly Agree |
| Plastic litter left on the ground will eventually find its way into the ocean. | 4.00 | Strongly Agree |
| Plastic litter thrown in the ocean does not quickly break down or disappear. | 4.00 | Strongly Agree |
| Plastic bags can take up to 20 years to decompose in the ocean. | 4.00 | Strongly Agree |
| In the ocean, discarded plastic bottles can decompose up to 450 years. | 4.00 | Strongly Agree |
| Fishing lines take 600 years to decompose in the ocean. | 4.00 | Strongly Agree |
| Marine plastic litter can disintegrate into harmful fragments called “microplastics”. | 4.00 | Strongly Agree |
| Fishes and other marine organisms eat plastic waste. | 4.00 | Strongly Agree |
| Marine plastic litter pollution in my community is increasing. | 3.00 | Agree |
| Solid Waste Management Act or RA 9003 prohibits the throwing of plastic waste into the environment. | 4.00 | Strongly Agree |
| **Overall Median** | 4.00 | Strongly Agree |

Range of Scoring: Strongly Disagree (1.00-1.75), Disagree (1.76-2.51), Agree (2.52-3.27), Strongly Agree (3.28-4.00)

While there was a strong consensus on most issues, there is slightly less perception of the increase of marine plastic litter pollution in the communities (3.00). According to the respondents, the status of marine plastic pollution in their area before was higher compared to today. Lastly, the Solid Waste Management Act (RA 9003) was recognized for prohibiting the disposal of plastic waste into the environment (4.00).

In general, the results highlight a strong and widespread acknowledgment of the various negative impacts of plastic waste by the coastal communities. Soares *et al*. (2020) emphasized that plastic waste has truly emerged as a pressing environmental and social challenge in daily living. It is important to remember that achieving integrated municipal solid waste management requires more than just local government providing the MSW infrastructures; it also requires an understanding of the knowledge, and behavior of the local communities (Chung and Lo, 2008).

## 3.4 Respondents are Concerned About Marine Plastic Litter

Figure 3 indicates the level of concern among respondents regarding marine plastic litter. The majority of the respondents responded as very concerned (86%) about this issue, while 13% showed a little worried and some were not worried at all (1%). These results reflect the attitude of coastal communities regarding marine plastic litter among the surveyed population. According to the residents, this issue was a significant concern because the plastic litter were floating everywhere. Moreover, after the high tide, this plastic litter will accumulate under their houses and the surroundings. The overwhelming majority expressing high concern suggests a robust recognition of the environmental impact and potential health risks associated with plastic pollution in marine environments.

These results were supported by the comparative study of Van Oosterhout *et al.* (2022) that throughout the EU, high levels of concern about MPL were observed. Public concern about marine plastic pollution has increased significantly over recent years, largely due to heightened media coverage and growing evidence of its detrimental effects on marine life and ecosystems (Hartley *et al.*, 2018). Similarly, around 80% of the respondents were either “very concerned” or “extremely concerned” about marine plastic litter in the study by Schneider *et al*. (2021).

The high percentage of respondents who are very concerned about marine plastic litter indicates a strong public mandate for actions to mitigate this environmental problem. Findings underscore the critical need for continued and enhanced efforts in public education and policy advocacy to address marine plastic pollution. Furthermore, the high level of concern about marine plastic litter among respondents reflects a growing public awareness and readiness to support measures aimed at addressing this environmental issue.

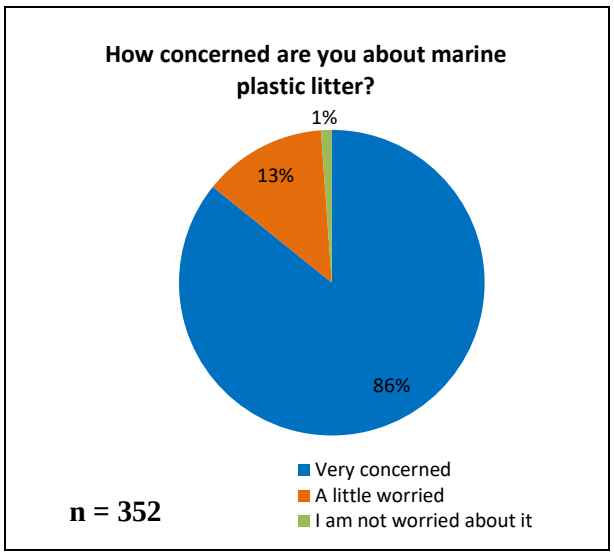



**Fig. 3: Respondents' level of concern towards Marine Plastic Litter**

## 3.5 Level of Attitude towards Marine Plastic Litter

Table 3 summarizes the level of attitudes of the coastal communities towards marine plastic litter. Results revealed that the level of attitudes of the respondents was very high with an overall median score of 4.0 (Strongly Agree). The highest median score (4.00) pertains to recognizing marine plastic litter as a critical problem. It implies that the respondents were truly aware of and acknowledged the seriousness of marine plastic pollution in their respective communities. According to Hartley *et al.* (2018), public awareness of marine plastic pollution is high and there is broad support for measures to mitigate the problem. There is also a positive attitude (4.00) on the necessity for a national plan to manage waste effectively to prevent it from becoming marine litter, and a similar consensus (4.00) that this issue should concern all sectors of society. Public awareness of the causes and consequences of marine plastic litter (4.00) and the regulation of plastic use in coastal areas (4.00) were also strongly supported. However, the support for banning single-use plastics was comparatively lower (3.00), indicating some hesitation or disagreement among the respondents. According to some, they use single-use plastics in their daily lives, especially for vendors, and fishermen. The study of Devi *et al.* (2022) showed that respondents are conscious of the impact of single-use plastic (SUP) pollution on people and the environment, however, their single-use plastic reduction is still slow. Interest in receiving more information about preventing marine plastic litter (4.00) and establishing partnerships to tackle pollution (4.00) were notably high, reflecting a proactive attitude towards finding solutions. Conversely, the perception of having sufficient information to take action was slightly weaker (3.00), suggesting a need for more education and resources. Understanding the behavioral and psychological factors of the communities is a crucial help in informing governmental strategies for waste management and solving household waste problems (Kofoworola, 2007).

**Table 3. Level of attitude towards Marine Plastic Litter**

| Statement | Median Score | Level of Attitude |
|---|---|---|
| I think marine plastic litter is currently a serious problem. | 4.00 | Strong Agree |
| The state must have a national plan that guarantees the proper management of waste so that it does not end up as marine litter. | 4.00 | Strong Agree |
| Large industries are the main cause of garbage in the seas, and therefore, they should be held responsible for this problem. | 4.00 | Strong Agree |
| The problem of marine plastic litter should concern all sectors of society. | 4.00 | Strong Agree |
| Raising public awareness of the causes and consequences of marine plastic litter | 4.00 | Strong Agree |
| Banning the production of single-use plastics | 3.00 | Agree |
| Regulating the use of plastics on beaches and coastal areas | 4.00 | Strong Agree |
| I want to receive more information on solutions to prevent marine plastic litter. | 4.00 | Strong Agree |
| I have enough information to take action to reduce marine plastic generation. | 3.00 | Agree |
| Establishing partnerships to address marine plastic pollution | 4.00 | Strong Agree |
| **Overall Median** | 4.00 | Strongly Agree |

Range of Scoring: Strongly Disagree (1.00-1.75), Disagree (1.76-2.51), Agree (2.52-3.27), Strongly Agree (3.28-4.00)

**Table 4. Level of practices in Plastic Waste Management**

| Statement | Median Score | Level of Practices |
|---|---|---|
| I research the consequences of marine plastic litter pollution. | 2.00 | Rarely |
| When I visit a beach or sea, I avoid polluting it by leaving waste behind. | 3.00 | Often |
| I do not consume products that have a high impact on the generation of marine plastic litter. | 2.00 | Rarely |
| I use my thermos or reusable water bottles to avoid drinking bottled water. | 3.00 | Often |
| I reduce the amount of plastic I consume. | 3.00 | Often |
| I tell my acquaintances about the marine plastic litter problem. | 2.00 | Rarely |
| I segregate my recyclable waste and deliver it for recycling. | 4.00 | Always |
| **Overall Median** | 3.00 | Often |

Range of Scoring: Never (1.00-1.75), Rarely (1.76-2.51), Often (2.52-3.27), Always (3.28-4.00)

### 3.6 Level of Practices in Plastic Waste Management

The respondents' level of practice was presented in Table 4, with an overall median score of 3.00 (Often), indicating that the respondents have a favorable level of practice on plastic waste management. Notably, respondents consistently practice waste segregation of recyclable wastes and deliver them to the recycling facilities, as evidenced by the highest median score of 4.00. The Environmental Protection Agency tackled different programs such as a national recycling strategy, waste-wise program, and sustainable materials management that can be adapted for effective and proper municipal solid waste management. Conversely, proactive research on the consequences of marine plastic litter (2.00) and avoiding products that significantly contribute to marine litter (2.00) were rarely undertaken, indicating a gap in knowledge-seeking and conscious consumption. Additionally, advocacy efforts, such as discussing the issue with acquaintances (2.00), were infrequent, which may limit broader community awareness and action. Positively, the respondents were also actively and often engaging in practices such as reducing the amount of plastic they consume (3.00), using their water bottles to avoid drinking bottled water (3.00) and avoid polluting the beach or sea by leaving waste behind (3.00). Individuals need to continue adopting sustainable practices and raising awareness about the impact of plastic waste on the environment.

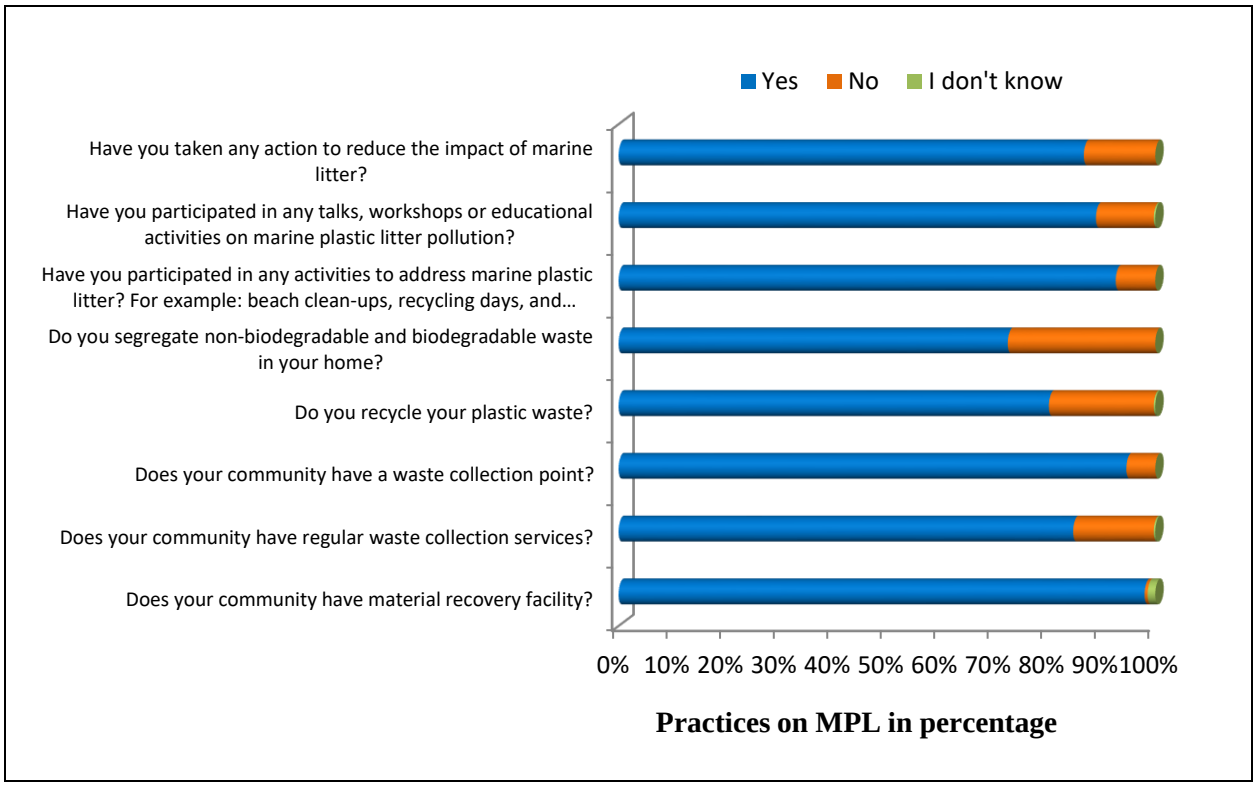



**Fig. 4: Respondents' practices on Plastic Waste Management**

### 3.7 Local Community's Practices on Plastic Waste Management

The respondents' practices in plastic waste management are summarized in Figure 4. The community demonstrated high engagement in waste management practices, with 98% acknowledging the establishment of a Material Recovery Facility (MRF) and possessing substantial knowledge about it. However, a small fraction (1%) was unaware of the MRF, likely those residing farther from the facility. Notably, the segregation of biodegradable from non-biodegradable waste received the highest "no" responses (28%), indicating that some respondents do not separate their household waste. This may be attributed to the practice of the barangay hiring individuals to sort waste at the MRF. Similar findings were reported by Red *et al.* (2022), where respondents seldom segregated their waste. Keramitsoglou and Tsagarakis (2013) emphasize that citizen participation in source separation significantly enhances the success of recycling programs.

Additionally, residents actively participate in activities addressing marine plastic litter, such as beach clean-ups, recycling days, and public awareness sessions. These practices are crucial in reducing plastic waste and combating marine litter pollution. Continued efforts in raising awareness, engaging in sustainable practices, and supporting waste management services are essential for fostering a cleaner and more sustainable environment.

### 3.8 Individual/Household Plastic Waste Disposal

In Figure 5, describes the highest percentage of household plastic waste disposal methods. 76% of the responses are “collected and put in a collection area/bin". This indicates that the majority of individuals and households opt to gather their plastic waste and place it in designated collection areas or bins for proper disposal, reflecting responsible respondents living in the communities. One of the participants shared that plastic waste was the first problem in their area near the coast. So, the barangay conducted a coastal cleanup drive thrice a week and established collection points in specific areas. According to Parrot *et al.* (2009), putting garbage in collection points inside towns or barangays is highly required and considers the needs of all residents in terms of the quantities of waste produced and the distance from their dwellings. Karadimas and Loumos (2008) proposed an innovative collection that estimated the generation of waste in each household, identified the location and allocation of waste bins, and supported the routing of garbage trucks for waste collection.

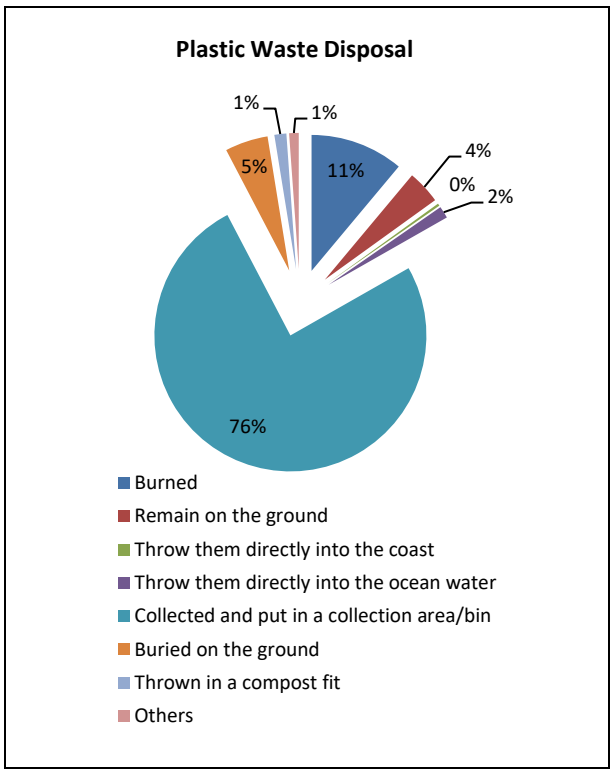



**Fig. 5: Frequency distribution of individual/household plastic waste disposal**

Following closely, the second-highest percentage is "Burned" at 11%. According to some of the respondents, burning plastics is just their option. They just dry it and then burn it as soon as the water is in low tide. Other respondents also responded that they don’t bring it to the collection area because it's far from their household, and they don't have enough time to hassle themselves. Similarly, in the study of Chaudhary *et al.* (2021), the respondents also burned their plastic waste because of lack of MRF or far from their household especially in covered areas.

It is interesting to see that only least responses were recorded on throwing their plastic waste directly into the coast and the ocean, thrown in compost, and others. Approximately two billion people globally lack access to collected garbage services and dispose of their rubbish by burying, burning, or dumping it into waterways or open land (Reyna *et al.* 2018).

### 3.9 Significant Differences between Coastal Community's Knowledge, Attitude, and Practices When Grouped by Their Socio-demographic Profile

Table 5 revealed the significant differences in knowledge, attitudes, and practices with socio-demographic profile as a grouping variable. The significant difference in knowledge levels when grouped to educational attainment ($p$-value = 0.009) suggests that education level contributes to a greater knowledge of the respondents on marine plastic litter issues. Individuals with higher educational qualifications have been exposed to more comprehensive information about marine plastic pollution.

Likewise, the respondents’ attitudes have also been found to have a significant difference when grouped by age ($p$-value = 0.027). It indicates that the level of attitude of coastal communities towards marine plastic litter varies notably across different age groups. This finding highlights the need for targeted awareness campaigns that cater to specific age demographics. On the other hand, there is no significant differences in practices, when grouped by socio-demographic profile, proposes that coastal communities exhibit similar practices on plastic waste management, regardless of their backgrounds.

**Table 5. Kruskal-Wallis' analysis of the relationship between knowledge, attitude, and practices with the selective socio-demographic profile only shows significant differences as a grouping variable**

| Variables | | *p*-value | Remark |
|---|---|---|---|
| Knowledge | Educational Attainment | 0.009 | Significant |
| Attitude | Age | 0.027 | Significant |
| Practices | Not Significant | | |

Note: The $p$-value is significant at <0.05.

### 3.10 Pairwise Comparison of Significant Variables

In Table 6, the DSCF pairwise comparison revealed significant differences in knowledge levels between individuals at the high school level and those who have graduated from high school ($p$=0.004). This suggests that higher educational attainment is associated with greater awareness and understanding of marine plastic pollution issues. Consistent with previous research indicating parental education influences solid waste management knowledge (Barloa *et al.* 2016), our findings support the notion that increased exposure to formal education enhances comprehension of complex environmental challenges such as marine plastics pollution.

The pairwise comparisons have also revealed that respondents aged 21 to 30 years have a higher level of attitude than 61 years old and above. This could imply that younger individuals might have more positive or proactive attitudes towards addressing marine pollution compared to older generations. This implication was supported by the study of Geiger *et al.* (2019) that age is considered a common predictor for the environmentally significant behavior of the respondents.

**Table 6. DSCF pairwise comparison is used to assess which variables cause the difference**

| Variable | | *p*-value | Remark |
|---|---|---|---|
| Knowledge | Educational Attainment | 0.004 | High School Level – High School Graduate |
| Attitude | Age | 0.040 | 21-30 years old – 61 years old and above |

Note: The *p*-value is significant at <0.05.

### 3.11 Significant Relationship of Coastal Community's Knowledge to Their Attitudes and Practices

The relationship between coastal community's knowledge and their attitudes has Spearman's rho value of 0.317 with a p-value of <.001 as shown in Table 7. The Spearman's rho value of 0.317 indicates that as the coastal community's knowledge about MPL increases, their attitudes toward managing MPL become more positive, but the impact is limited. This suggests that while educational campaigns may improve environmental awareness and outlook, other factors may shape individuals' attitudes, such as cultural beliefs, community norms, or personal experiences with MPL. Thus, interventions focusing on improving knowledge should be coupled with strategies that address these deeper motivational factors, such as promoting local role models who adopt environmentally friendly attitudes and actions.

Similarly, the correlation of coastal community's knowledge to their practices, represented by a Spearman's rho value of 0.138 with a *p*-value of 0.010, implies a weak positive correlation between the two variables. This means that as the knowledge of the coastal community increases, their practices tend to improve slightly. This highlights that while knowledge is necessary, it may not be the sole driver of behavioral change. Other influences—such as access to infrastructure (e.g., waste collection points), economic constraints, and community-wide policies—might play a larger role in shaping waste management practices. This finding underscores the need for holistic interventions that combine education with practical support mechanisms like incentives for proper waste disposal, improving waste management infrastructure, and strengthening community enforcement of environmental regulations like RA 9003 (Ecological Solid Waste Management Act).

Through these findings, it depicts that while education is important, it alone cannot guarantee positive changes in attitudes and practices towards marine plastic pollution. To achieve lasting results, community-based interventions should combine educational campaigns with practical solutions and strong policies that address the underlying reasons for improper waste management.

**Table 7. Spearman correlation of respondents' knowledge to their attitudes and practices towards marine plastic litter**

| | | Attitude | Practices |
|---|---|---|---|
| Knowledge | Spearman's rho | 0.317*** | 0.138** |
| | Df | 350 | 350 |
| | p-value | <.001 | 0.010 |

Note: Correlation is significant at p <.05*, p <.01**, and p<.001***.

## 4. CONCLUSIONS

The results revealed the predominant demographic features of the respondents that include a majority of women, who were married with ages ranging from 41 to 51 years old. High school level was the major educational attainment of the respondents with a monthly income of below P5,000. Fishermen had the highest percentage of source of income and the respondents had 20 years and above of residency in the community.

The respondents' level of knowledge was very high regarding the general impacts of plastic waste, including its environmental and health consequences. Meanwhile, the respondents also had a very high level of attitude, acknowledging marine plastic litter as currently a serious problem. The communities were very concerned about this critical issue, reflecting a strong public mandate for further action and education. Moreover, the respondents showed a high level of practices in plastic waste management, engaging in proper segregation and recycling. Putting their trash in

the collection bins in the MRF was the most individual/household waste disposal.

When grouped by the socio-demographic profile, knowledge significantly differs by educational attainment, while attitude has significant difference to age. However, respondents' practices on plastic waste management do not vary by their backgrounds. Furthermore, pairwise comparison analysis showed significant differences between individuals with only a high school education and those who are high school graduates, as well as between those aged 61 and older and those aged 21 to 30.

Lastly, the analysis showed a significantly weak positive correlation between respondents' knowledge, and their attitudes and practices. These findings highlight that while greater knowledge contributes to more positive attitudes and better practices, additional factors and targeted interventions are necessary to further influence the respondent's behaviors and practices related to marine plastic litter.

### Recommendations

To effectively address marine plastic pollution in Tangub City, a comprehensive community-based plastic waste management program is essential. This program should prioritize educational campaigns through symposiums with infographic and visual aids that disseminate information about the detrimental effects of marine plastic pollution, including microplastics and single-use plastics. Additionally, implementing incentives or rewards for responsible waste management practices can encourage positive behavior among households and businesses. To further enhance waste management, accessible collection points should be established, to make proper waste disposal easier and more convenient for all residents. Strict enforcement of waste management laws, particularly RA 9003, must be prioritized, with measures like CCTV surveillance to monitor illegal dumping and violations. Furthermore, local policies that address specific challenges faced by the community and actively involve residents in sustainable practices are necessary to ensure long-term success. By integrating education, enforcement, infrastructure, and community participation, this program would provide Tangub City with a localized sustainable solution to its plastic waste problem.

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## CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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