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ORIGINAL RESEARCH ARTICLE

Evaluation of community behavior regarding the risk of plastic micro-pollution on the environment health

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ABSTRACT

BACKGROUND AND OBJECTIVES: Plastic pollution is increasing globally along with the growing consumption patterns of the global community, leading to practicality (social behavior). The primary contributors to pollution are single-use plastic (SUP) items and inadequate waste management techniques. This research attempts to examine local communities' determinants and behavioral patterns regarding plastic waste management.

METHODS: This cross-sectional analytical study includes 195 respondents and conducted at Antang Lake, Makassar. The social sciences statistical package version 26 was used to perform chi-square tests and multiple regression analysis to examine the main elements influencing individual behavior toward plastic waste management. A survey instrument was provided to participants for data collection.

FINDINGS: The chi-square test results show that the knowledge variable has a statistically significant relationship with plastic waste management behavior at home, with a test statistical value of 0.002. Respondents with limited knowledge are 2.603 times more likely to have poor household plastic waste management behavior than those with substantial knowledge. The knowledge variable is also significantly related to household plastic waste management behavior simultaneously with a statistical test value of 0.000, showing a strong relationship. This variable influences 11.8 percent of the behavior in question. Attitude and action variables do not have a significant relationship partially or simultaneously with household plastic waste management behavior.

CONCLUSION: Increased plastic consumption has led to microplastic pollution, environmental damage, and deteriorating health conditions. Thus, intervention is required to improve optimal waste management behavior in the community. Increasing awareness about environmental management and educating the public on the impact of microplastics on family health can contribute to enhanced knowledge awareness. This research aims encourage greater awareness of environmental condition to minimize toxicity resulting from the negative impacts of plastic waste.

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
49	3	8

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INTRODUCTION

Plastic is a versatile material that can be processed using various manufacturing techniques and has huge market potential. Polymer chains of monomers are combined in repeating patterns to form plastic (Choudhury *et al*., 2022). More than 50 percent (%) of existing plastic is single-use plastic (SUP) and is one of the main components of solid waste (Jahani *et al*., 2019). People's daily behavioral patterns become increasingly, contributing to the growing plastic use worldwide. This circumstance is driven by the widespread use of SUP for daily requirements by a large number of people worldwide. This situation promotes post-use plastic pollution in the form of goods and SUP sachets, accompanied by inadequate waste management practices in several regions worldwide (Yang *et al*., 2022). Society plays a direct role in creating demand for SUP. People's perceptions and desires greatly influence people's behavior (Van Rensburg *et al.,* 2020). Post-pandemic plastic waste mishandling has increased rapidly and caused serious environmental impacts because of the ineffectiveness and inadequacy of the current waste management system and the lack of enforcement of environmental regulations (Raja *et al.,* 2020). Amid various human pressures on aquatic ecosystems, the accumulation of plastic waste is one of the most evident but least studied (Mihai *et al*., 2021). Several studies have shown that plastic additives, such as Bisphenol A (BPA) and phthalates, can cause adverse effects on human reproduction and growth, including carcinogenesis. In addition, microplastics contaminated with harmful chemicals can accumulate in the human body by consuming seafood and polluted drinking water (Katyal *et al*., 2020). The non-biodegradability of plastic, unsustainable usage, presence of heavy metal content, and inappropriate waste management have led to extensive accumulation of plastic in natural habitats (Kumar *et al*., 2021). The microplastics (MPs) can be detected in aquatic environments due to the degradation processes (Stead and Bond, 2023). This phenomenon gives rise to detrimental consequences concerning the environment and human well-being (Okunola *et al*., 2019). Plastics of various sizes, classes, and origins are found in aquatic environments (rivers, lakes, and seas) (Anderson *et al*., 2016). The impacts of plastic waste are evident in several countries, including Asuncion Bay, Paraguay (Diez-Pérez *et al.,* 2023), China (Chen *et al*., 2023), and Ireland (Devereux *et al*., 2023). MPs can be detected in various maritime ecosystems (Guzzetti *et al.,* 2018), particularly in areas characterized by substantial human influence (Cordova *et al*., 2022). MPs are plastic particles that measure less than 5 millimeters (mm) in size. These particles can be introduced into the environment through sources, such as personal care products, activities, and the breakdown of larger plastic items (Buwono *et al*., 2022). These fragments, composed of plastic materials, pose significant challenges within marine ecosystems (Yuan *et al*., 2023). Aggregated MPs tend to sink to the sea floor, potentially becoming accessible to benthic populations (Riani and Cordova, 2022). MPs can readily assimilate into biological processes, leading to adverse consequences on aquatic species given their comparable dimensions to the primary food sources of abundant aquatic organisms (Chen *et al*., 2022). A wide range of marine invertebrates, fish, marine reptiles, and marine mammals have been documented as consuming plastic particles of varying sizes (Buwono *et al*., 2022). When fish consume MP particles, the ingestion is often accompanied by the presence of toxins, severely damaging the fish upon ingestion. In addition, the particles have the potential to be transferred and deposited higher up in the food chain. MPs are anticipated to engage with diverse organisms owing to their diminutive dimensions, which can lead to detrimental consequences when consumed in elevated quantities. The potential outcomes can arise either directly through the initiation of oxidative stress and harm or indirectly through increased susceptibility to pollutants, such as absorbed chemicals. MPs may also contribute to decreased population density resulting from biological mortality. The size and shape of MPs affect their interactions with organisms. On the contrary, MPs can promote the activation of natural immune responses and can alter the makeup of microbial communities in the gastrointestinal tract, initiating inflammatory reactions and damage to the gut epithelium (Wu *et al*., 2023). Ocean circulation has a crucial role in the distribution and transport of MPs, a consequence of water pollution issues addressed by MPs. The importance of high-resolution spatial mapping in the understanding of global MP distribution budgets cannot be overstated (Enfrin *et al*., 2019). Numerous studies and authoritative reports affirm that the contamination of marine ecosystems by MPs primarily originates from terrestrial and fluvial sources (Costa *et al.,* 2023). MPs have also emerged as a significant contaminant in the present context, presenting an ecological hazard to surface water ecosystems (Velmurugan *et al.,* 2023). Plastic pollution can cause significant health risks to humans given the ability of microplastics to absorb heavy metals and other dangerous chemicals. Consumption of fish contaminated with microplastics and heavy metals can cause heavy metal poisoning and other health problems. Some health risks associated with exposure to microplastics through fish consumption include oxidative damage to lipids, neurotoxic effects, and human health risks associated with exposure through consumption (Karbassi and Pazoki, 2015). However, in-depth research is still required to fully understand the impact of plastic pollution on health (Sabilillah *et al*., 2023). Plastic waste possesses the capacity to store potentially harmful compounds or chemicals, such as chemical additives, adsorbed chemicals, and unreacted starting ingredients (monomers). These substances fulfill significant roles in plastics and are categorized as antimicrobial agents (biocides), blowing agents, flame retardants, organic dyes, monomers, cross-linkers, hardeners, chain modifiers, catalysts, ultraviolet (UV) stabilizers, antioxidants, plasticizers, solvents, and miscellaneous substances that do not neatly fit into other classifications (Garello *et al.*, 2023). The Irish study considered the impact of the Corona Virus Disease 2019 (Covid-19) pandemic on plastic pollution in the River Thames. The study results showed an increase in MPs during the second lockdown in November 2020, where polyvinyl chloride (PVC) plastic dominated. A decrease in MPs was observed during the first lockdown, but the MP levels have not normalized after the pandemic. The Limehouse site had more MPs during the first lockdown, possibly because the area is densely populated and close to the port (Devereux *et al*., 2023). Indonesia was identified as a prominent contributor to the substantial accumulation of plastic garbage in the world's oceans (Arpia *et al*., 2021). The escalating concern over this issue is attributed to the uncontrolled rise in pollution levels in inland waters, as well as marine and lake habitats, caused by MP contamination (Ali *et al*., 2021). Within various existing research, studies on MP pollution in Indonesian seas and freshwater ecosystems, particularly rivers and lakes, are still relatively new but have garnered increasing interest from various groups (Kumar *et al*., 2021). The comprehensive analysis of the movement patterns of MPs is crucial for gaining insights into their distribution and the factors influencing their abundance. The understanding of the impact of MPs on the operational efficiency of waste water treatment plant (WWTP) processes is closely tied to the assessment of associated operational expenses. The presence of MPs not only hampers the efficiency of the water treatment process but also has a detrimental impact on the quality of treated water. The tactics encompass the application of surface changes to membranes, the utilization of coagulation agents that have been optimized for their effectiveness, and the development of resistance against microbes that may be impacted by the presence of MPs. By implementing these strategies, alleviating any negative impacts exerted by MPs on the overall efficiency of WWTP operations (Enfrin *et al*., 2019). Managing household and industrial wastes involves different challenges and requirements. Household wastes are usually produced in smaller quantities and have more homogeneous properties. Thus, they are easier to collect, separate, and recycle than industrial wastes. Industrial wastes are generally produced in larger quantities and have more complex properties, including various types of hazardous materials and debris, requiring sophisticated technology and infrastructure for their management. Industrial waste management necessitates substantial costs and meticulous planning and supervision to ensure safe generation and disposal of wastes in compliance with applicable environmental regulations and standards (Thanh *et al*., 2011). The novelty of this research lies in the emphasis on innovation and community involvement by focusing on variables, such as knowledge, attitudes, and actions regarding household plastic waste management behavior. Household plastic waste is the main focus because it dominates other types of household waste. Other research includes investigating household waste management practices and perceptions about waste management (Fadhullah *et al*., 2022), river plastic pollution, and its impact on human health (Sabilillah *et al*., 2023). Meanwhile, this research integrates household plastic waste management behavior analysis and determines the negative impact of plastic waste on human and environmental health. The harmful impact of MP waste affects not only human health but also marine ecosystems. People believe that the continually increasing volume of plastic waste will have detrimental effects on livestock. A survey is conducted in this study by observing MP pollution in water areas and its impact on the Makasar water. The innovation resulting from this research intends to determine the household plastic waste management behavior. It also provides innovation for future researchers to explore and further investigate the impact of plastic waste pollution. The government is also expected to provide policies to inform the public about excessive use of plastic. The public is encouraged to participate in preserving the environment by reducing the use of SUP. This study, conducted in Makassar, Indonesia, in 2023, aims to examine the determinants of household plastic waste management behavior by assessing MPs pollution and environmental health.

MATERIALS AND METHODS

This study was conducted at Antang Lake, Makassar City (Fig. 1). Makassar is the capital of South Sulawesi Province, located at Latitude -5.135399 and Latitude 119.423790. The average air temperature in Makassar City ranges from 27 degrees Celsius (°C) to 29.0 °C. The average rainfall is 311 mm, and the average number of rainy days is approximately 17. The study was conducted in August–October 2023. The approach was quantitative study with a cross-sectional research design. A total of 195 respondents were involved in this study with the following inclusion criteria: household heads or other family members who lived around Antang Lake and landfills/ Tempat Pembuangan Akhir (TPA) Antang, Makasar City, Indonesia.

Survey and sample size

During data collection, all respondents agreed to complete the research and document their answers. The total number of respondents in this study was 195. Questionnaires and structured interviews were used to collect accurate data regarding demographics and household plastic waste management behavior based on respondents' knowledge, attitudes, and actions. The behavioral questionnaire consists of

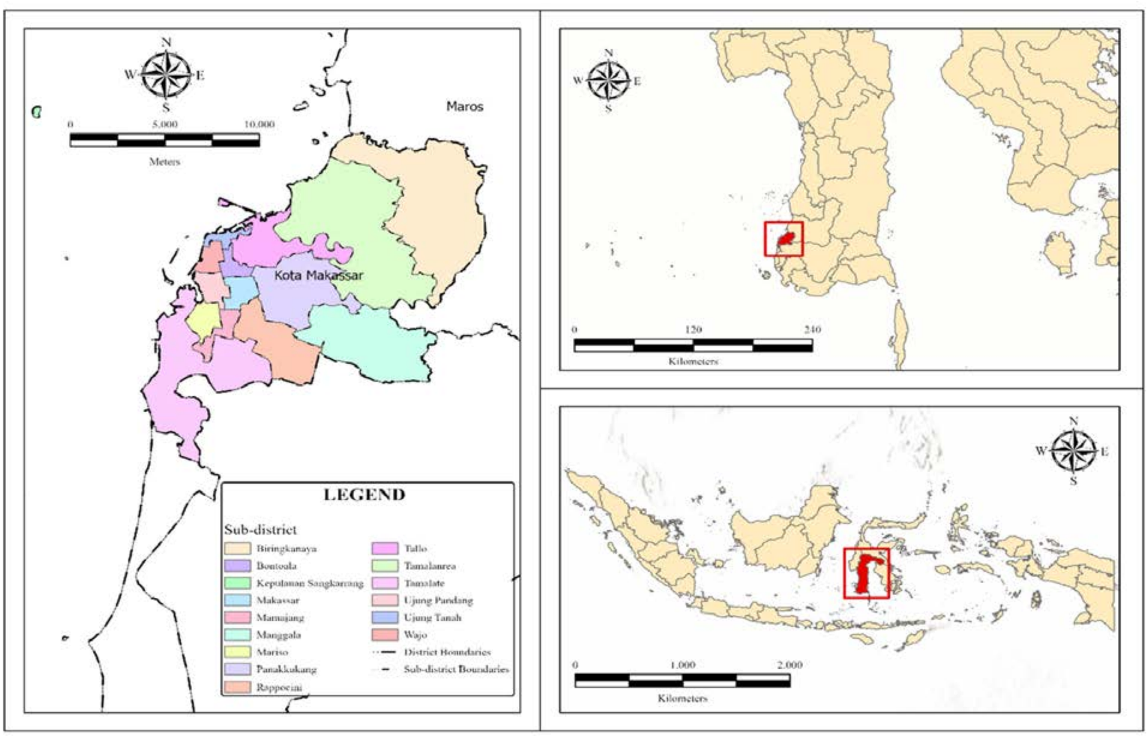

Fig. 1: Geographic location of the study area of Makasar City in Indonesia

19 points, including 14 questions with yes or no answers and five questions with typical simple answers. An example of a behavioral question in the questionnaire is as follows: "Is plastic waste scattered or piled up around your home?" The knowledge questionnaire consists of six questions with typical right and wrong answers. An example of a knowledge question in the questionnaire is as follows: "The ingestion of microplastics through contaminated seafood poses potential risks to human health by introducing harmful substances into the food chain." Six questions were asked to assess the respondents' attitudes, using Likert scale, as follows: strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD). For example, "It is posited that microplastics may provide a potential threat to human health." The questionnaire to evaluate the respondents' actions contain six questions, using Likert scale, as follows: very often (VO), often (O), rarely (RA), and never (N). Tables 1, 2, 3, and 4 show the questionnaires used in the data collection process.

Analysis procedures

During data collection, all respondents agreed to complete the research and document their answers. The data collection stage started with the creation of the inclusion criteria, followed by the actual data collection by the researcher. Subsequently, the researcher performed data encoding in Microsoft Excel to simplify the data processing. Statistical package for the social science (SPSS) version 26 was used for data processing. The univariate approach was applied to examine the frequency and percentage of demographic variables among respondents, including gender, age, marital status, education level, occupation, residency length, and income. The correlation test was performed using the Chi-square analysis technique. This study-dependent variable

Table 1: Household plastic waste management behavior

Questions		Yes	No
1	Is plastic waste scattered or piled up around your home?	125	70
2	Are there lots of flies around the pile of plastic waste?	117	78
3	Are there lots of mice around plastic waste?	126	69
4	Are there many mosquitoes around plastic waste?	150	45
5	Do many animals (cats, dogs, etc.) come to the plastic waste pile?	130	65
6	Is there a disturbing smell around the pile of plastic waste?	86	109
7	Is there a blockage in the drainage channel due to plastic waste?	36	159
8	Did you know that plastic waste can be managed and is beneficial?	149	46
9	Do you manage plastic waste?	45	150
10	Are there any plastic waste management community activities in your area?	16	179
11	Do you take part in plastic waste management activities?	18	177
12	Do you want to take part in plastic waste management activities?	58	137
13	Do you sort plastic waste before throwing it away?	57	138
14	Do you think that rubbish is always collected on time?	131	64

Table 2: Respondent's knowledge

Statement	Correct	Wrong
1 The ingestion of microplastics through contaminated seafood poses potential risks to human health by introducing harmful substances into the food chain.	129	66
2 Microplastics have the potential to infiltrate aquatic ecosystems, hence posing a threat to marine organisms, including fish and other marine fauna.	156	39
3 Microplastics have the potential to cause disruption within aquatic ecosystems and inflict harm upon the species inhabiting them.	143	52
4 It is widely acknowledged that plastic trash has the potential to contaminate and degrade soil quality. So correct them accurately and completely in the right English se	146	49
5 It is widely acknowledged that plastic garbage has the potential to contaminate the atmosphere.	127	68
6 It is widely acknowledged that plastic waste can give rise to many challenges for cattle.	100	95

Table 3: Respondent's attitudes

Statement	SA	A	SD	D
1 There is an opinion that microplastics can potentially threaten human health.	34	127	26	8
2 There are concerns that microplastics may hurt wildlife, including bird species, aquatic organisms, and other fauna.	6	90	81	18
3 It is essential to invite the wider community to actively participate in preserving the lake and surrounding waters by keeping them clean.	12	82	86	15
4 It is essential to practice reusing plastic waste to contribute to environmental sustainability.	8	99	75	13
5 Practicing plastic waste segregation in the home environment and committing to responsible waste management is very important.	7	111	55	22
6 It is essential to implement restrictions or bans on single-use plastics, such as straws, plastic bags, and plastic bottles, which is an essential step in mitigating the problem of microplastic pollution.	39	96	54	6

Table 4: Respondent's actions

Statement	VO	O	R	N
1 Reduce the use of plastic in everyday life.	6	40	119	30
2 Bring a cloth shopping bag when shopping.	6	24	94	71
3 Use metal or paper straws instead of plastic straws	2	25	84	84
4 Learn how to sort and recycle plastic	3	27	75	90
5 Talk to friends and family about the dangers of Microplastics and the importance of reducing plastic consumption and disposing of waste properly	5	17	66	107
6 Collaborate with groups or organizations that care about environmental problems to increase awareness about Microplastics and actions that can be taken to reduce their impact	5	6	50	134

indicates a community behavior toward plastic waste management. The independent variables comprise knowledge, attitudes, and community actions. Researchers provide codes by changing data from sentences or letters into numbers to assist in efficient data processing. The coding in question involves replacing response codes with numbers. The coded data include demographic data, dengue prevention behavior data, knowledge attitude data, social media use data, and social support data. The following hypotheses are put forward in this research:

Hypothesis 1: A relationship exists between knowledge and household plastic waste management behavior.

Hypothesis 2: A relationship exists between attitude and household plastic waste management behavior.

Hypothesis 3: A relationship exists between action and household plastic waste management behavior.

RESULTS AND DISCUSSION

The study sample consisted of 195 individuals, where 170 participants are female. According to Deng *et al.* (2020), gender is significantly related to plastic waste management behavior with a *p*-value of 0.002. The average age of 83 respondents was 26–40, and 175 participants were married. A total of 63 respondents had completed secondary school, and 97 respondents worked as entrepreneurs/traders/services. Previous research suggested that the respondent's educational level is significantly related to plastic waste management behavior, with a *p*-value of 0.001, whereas the age variable is significantly associated with a *p*-value of 0.001 (Fadhullah *et al*., 2021). Thirty respondents were from the Bangkala sub-district and Manggal sub-district, and most of them (71) were residents for 1–14 years; the income of 93 respondents amounted to USD 48–160 (Table 5).

The results suggest a statistically significant correlation between the knowledge variable and the behavior of household plastic waste management, as indicated by a probability test value (*p*-value) of 0.002 (*p*-value less than (<) 0.05) (Samimi and Moghadam, 2024) (Table 6). These findings indicated that 41 respondents had good knowledge and behavior, whereas 57 respondents had poor knowledge.

Table 5: Respondents Demographic Characteristics (n= 195)

Variable	Frequency	Percentage (%)
Gender		
Male	25	12.8
Female	170	87.2
Age		
<25 years old	24	12.3
26 – 40 years old	83	42.6
41 – 54 years old	53	27.2
55 – 69 years old	30	15.4
>70 years old	5	2.6
Marital Status		
Married	175	89.7
Unmarried	14	7,2
Divorce	2	1
Widowed	4	2.1
Tertiary Education		
Never school	8	4.1
Not graduated from Elementary School	22	11.3
Graduated from Elementary School	40	20.5
Graduated from Junior High School	39	20
Graduated from Senior High School	63	32.3
Graduated from Associate Degree	9	4.6
Graduated from university	14	7.2
Job		
Jobless	2	1
Students/College Students	2	1
Civil Servants/TNI/Polri/BUMN/BUMD	13	6.7
Private employees	17	8.7
Entrepreneur/trader/service	97	49.7
Farmer	2	1
Others	62	31.8
Sub-district		
Antang	25	12.8
Bangkala	30	15.4
Batua	22	11.3
Biring Romang	15	7.7
Bitoa	29	14.9
Borong	15	7.7
Manggala	30	15.4
Tamangapa	29	14.9
Stay length		
1 – 14 years	71	36.4
15 – 29 years	49	25.1
30 – 44 years	44	22.6
45 – 59 years	20	10.3
60 – 74 years	11	5.6
Income		
Rp 4.000.000	20	10.3
Rp 2.500.000 – Rp 4.000.000	62	31.8
Rp 750.000 – Rp 2.500.000	93	47.7
<Rp 750.000	20	10.2

Seventy-six respondents had poor knowledge and behavior in managing household plastic waste. Twenty-one respondents had good knowledge, but had poor behavior in managing household plastic waste. The odds ratio (OR) for the knowledge variable is 2.603, with a 95% confidence level (CI) value in the

Table 6: Chi-square test results of household plastic waste management behavior

Variable	Household plastic waste management behavior				Total	OR (95% CI)	*p-value*
	Poor		Good				
	n	%	n	%			
Knowledge							
Poor	76	57.1	57	42.9	133	2.603	0.002
Good	21	33.9	41	66.1	62	1.389 – 4.879	
Attitude							
Poor	65	54.7	54	45.3	119	1.655	0.088
Good	32	42.1	44	57.9	76	0.926 – 2.959	
Action							
Poor	50	45.8	59	54.2	109	0.703	0.223
Good	47	54.7	39	45.3	86	0.399 – 1.240	

range of 1.389–4.879.

The attitude variable has a *p*-value of 0.088, which is negatively related to household plastic waste management behavior. On the contrary, the OR value is 1.655, with a 95% CI value ranging from 0.926 to 2.959. This finding indicates a relationship between behavior and household plastic waste management. The *p*-value of 0.088 suggests that the observed link does not reach statistical significance when applying the conventional significance level of 0.05. The majority of respondents had terrible attitudes toward household plastic waste management, approximately 65 respondents, and only 44 respondents presented positive attitudes toward household plastic waste management. Lastly, the action variable was also negatively related (*p*-value = 0.223); 50 respondents had poor actions toward household plastic waste management, and only 39 respondents had favorable actions toward household plastic waste management. The OR is 0.703, whereas the 95% CI value ranges from 0.399 to 1.240, indicating a relationship between action and management of household plastic waste. The *p*-value of 0.223 indicates that this relationship is not statistically significant given the commonly used significance level (0.05). The research results in Table 6 show that the knowledge variable is significantly related to household plastic waste management behavior (*p*-value < 0.05). Meanwhile, the attitude and action variables do not affect a person's behavior toward plastic waste management (*p*-value more than (>) 0.05) (Table 6). Based on similar previous research results, only the knowledge variable positively relates to waste management behavior (*p*-value = 0.001) (Zhang *et al*., 2021).

The results of the regression test in Table 7 illustrate that the knowledge variable yielded a *p*-value of 0.000, indicating a statistically significant association between the knowledge variable and plastic waste management behavior. The OR for the knowledge variable is 0.118, suggesting that the knowledge variable has a statistically significant influence of 11.8% on individuals' behavior in the management of plastic garbage. This finding is supported by a 95% Confidence Interval (CI) ranging from 0.071 to 0.165. Moreover, the attitude variable, with a *p*-value of 0.787, and the action variable, with a *p*-value of 0.295, did not demonstrate a statistically significant impact on plastic waste management behavior (*p*-value > 0.05). The correlation coefficient has a correlation coefficient (R) value of 0.356 (or 35.6%). The coefficient of determination has an R square value of 0.127 (or 12.7%). R square is simply the square of R, that is, R times R (Table 8). In a study conducted in Malaysia, several factors had a significant influence on household plastic waste management behavior. These factors include the location of residence (*p*-value < 0.001), age (*p*-value < 0.001), housing type (*p*-value < 0.003), and knowledge (*p*-value < 0.003). The survey participants exhibited a high level of awareness and knowledge regarding appropriate waste management practices, with 92.9% indicating sufficient understanding in this area. The heightened level of consciousness regarding correct waste disposal can be attributed to various factors. The primary determinant is cleanliness, accounting for 81.4% of the motivation. In addition, concerns related to disease prevention contribute to 12.4% of the overall awareness, whereas apprehensions regarding unpleasant odors account for 6.2% of the observed trend (Fadhullah *et al.,* 2022). Table 2 shows that 129

Table 7: Regression análisis

Variable	OR	95% CI	p-value	Explanation
Knowledge	0.118	0.071 – 0.165	0.000	Hypotesis 1 accepted
Attitude	0.006	-0.039 – 0.051	0.787	Hypothesis 2 rejected
Action	-0.023	-0.066 – 0.020	0.295	Hypothesis 3 rejected

Table 8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.356[a]	.127	.113	.15124

a. Predictors: (Constant), action, knowledge, attituted

respondents stated that that microplastic waste can cause toxicity to human health and living creatures. Moreover, 127 respondents agreed and 34 strongly agreed that microplastic destruction threatens human health. This statement is strengthened by several studies that explain that microplastic waste can cause toxicity to human and environmental health (Yee *et al.*, 2021). Strengthening the results of previous research, the knowledge variable is positively related with a *p*-value of 0.000, indicating that knowledge is significantly associated with household plastic waste management behavior. Variable knowledge of plastic waste on environmental health with a *p*-value of 0.002 (OR 0.221) and knowledge of plastic waste on human health with a *p*-value of 0.010 (OR 0.209) (Deng *et al.*, 2020). More focused, detailed, and sustainable awareness and knowledge must be emphasized in this regard, especially on the topics of environmental cleaning, drainage systems, recycling in theory and practice, as well as proper waste disposal (Saat *et al.*, 2018). Adequate knowledge, such as clear instructions in communications and collection campaigns, can increase the likelihood of implementing waste sorting behavior (Fadhullah *et al.*, 2022). Some obstacles that prevent waste management from being optimal are ineffective waste management measures, such as dangerous waste dumps, lack of technical knowledge, economic and scientific resources, and a lack of emergency waste processing policies, causing severe consequences for the community and workers (Sarkodie and Owusu, 2021). Plastic becomes MPs through environmental decomposition, including sunlight. This process causes plastic to become brittle, but does not decompose completely. This material is transformed into small pieces called MPs (Rahmawati, 2023). MP pollution from water to the human body, through blood, is classified as a "non-Newtonian" fluid because its viscosity varies with shear rate (Sloop *et al.*, 2020). Table 4, showing respondents' actions, indicates that 119 respondents stated that they still rarely reduce the use of plastic in daily life. Another research report suggests that 87.97% of respondents agreed that plastic waste is toxic to human life, and 87.17% of respondents agreed that they would change shopping bags from plastic to environmentally friendly materials (Charitou *et al.*, 2021). Various actions are performed to reduce SUP pollution, including recycling waste, participating in clean-up activities, contributing to environmental campaigns, and throwing plastic waste in the trash. A total of 25.3% of respondents threw plastic waste in the garbage, 24% participated in environmental cleaning activities, and 17% assisted in ecological campaigns. However, 21% of respondents have not taken any action to reduce the use of SUP (Oguge *et al.*, 2021). Research results were conducted by Akdogan *et al.* (2023) by blue particles (25% in water and 18% in sediment). According to the findings of Raman spectroscopic examination, polyethylene terephthalate (PET) constituted 28% and polyamide (PA) constituted 27% of the polymers present in the water sample. Conversely, in the sediment sample, polystyrene (PS) was a dominant polymer, accounting for 56% of the total polymers detected. Contrary to other rivers, the Ergene River exhibits an abundance of several tiers of MPs. A research conducted in Italy using cross-sectional methodology has also indicated a significant and promising decline in pollution at the molecular level, as well as the alleviation of anthropogenic stress. Nevertheless, precise numeric values cannot be assigned to the fluctuations in volatile loads that may be directly linked to specific sources, such as tourist behavior, traffic patterns, urban water systems, and plastic pollution. Consequently, a drop in pollution level was observed; nevertheless, the MPs in Italy still contribute to water contamination (Koumi *et al*., 2021). Diez–Pérez *et al*. (2023) stated that MPs were detected in all of the samples analyzed. The presence of MPs was significantly higher (p-value < 0.05) in water collected from the bay, with an average concentration of 13.2 plus or minus (±) 13.4 items/cubic meter (m^3), compared with water from the tributaries, with an average concentration of 1.0 ± 0.5 items/m^3. Abundant monomeric units, known as MPs, are frequently encountered in the form of polymers. These polymers exhibit varying levels of abundance, with polypropylene being the most prevalent, followed by high-density polyethylene and low-density polyethylene. These polymers can possess transparent or white characteristics. Fig. 2 shows that 155 participants engaged in the daily practice of collecting plastic debris from their households. Another research discussed about the manner of waste disposal, where 84.2% of the respondents use disposal containers near their house. In this study, "smart trash cans" are used in managing plastic wastes optimally. These cans work by collecting waste in containers, optimizing the process of transporting packaging waste from urban containers to sorting plants.

This approach reduces the final cost of recycled plastic through transportation and testing fuel efficiency. Subsequently, in the sorting process, the types of waste collected from the factory are separated per category. The last step is recycling. In the final stage, the development and validation of retail value products from plastic packaging waste are carried out, leading to the stabilization of the cost of recycled materials and creating better outcomes for the market (Cerasi *et al*., 2021). The areas within Teddington exhibited elevated levels of MPs during the Covid-19 pandemic, despite the absence of lockdown measures, compared with the pre-pandemic period. This phenomenon occurred because the public utilized the river for recreational purposes when the lockdown was lifted. Consequently, local authorities and law enforcement agencies restricted access to islands and beaches by using barricades. The decrease in activity observed at Tilbury can be attributed to the absence of cruise ship departures from the vicinity, given the proximity of the sample location to Tilbury harbor. The port's cargo operations had been temporarily halted during the Covid-19 outbreak. Consequently, the discharge of gray water from cruise ships is reduced, a wastewater stream known for its elevated levels of contaminants. MPs were present in all samples in this study. The findings indicate a correlation between the prevalence of MPs and the occurrence of Covid-19, particularly in relation to samples collected prior to the Covid-19 pandemic and during periods when lockdown measures were not in effect, with a particular emphasis on the second lockdown. The enhanced performance of MPs in this study can be related to suboptimal consumption, inefficiency in disposal, and damage to the face masks employed

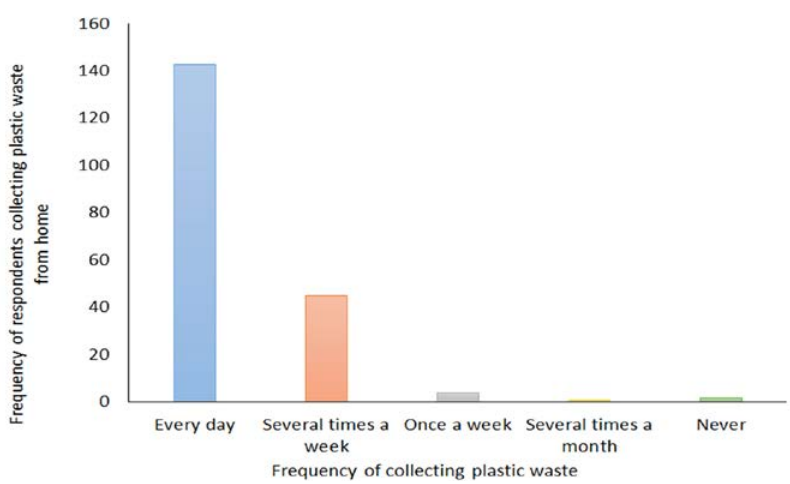

Fig. 2: Frequency of collecting plastic waste from home

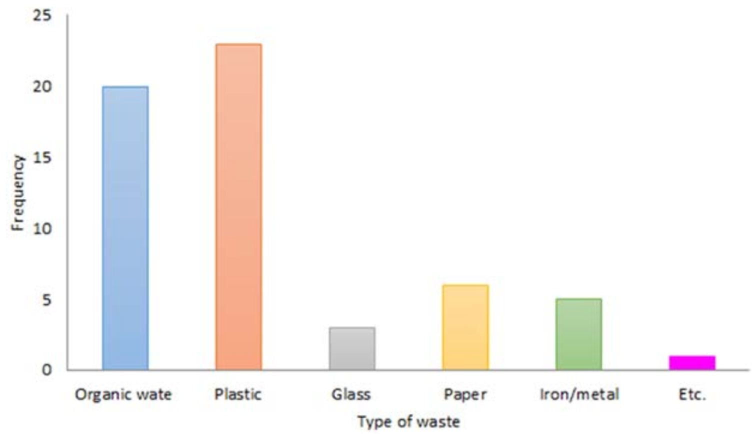

Fig. 3: Handling of plastic waste by the community around Lake Antang

during the epidemic. An investigation was conducted to explore the possibility of rainfall as a contributing factor to the observed high abundance of MPs during the second lockdown. Nevertheless, the abundance of rainfall within the preceding 24-hour period did not exhibit any discernible impact. The impact of the Covid-19 pandemic on plastic pollution globally may not be immediately apparent due to the reduction in production of plastic products, such as masks and gloves. However, the release of MPs into the environment may be exacerbated as a result (Devereux *et al*., 2023). The study results in Fig. 3, showing the waste management process, indicate that an average of 80.7% respondents stated that they disposed their household plastic waste by transporting to a waste collection service, and 18 respondents disposed their household plastic waste by throwing into a hole and covered with soil. Another study stated that 113 (36%) respondents used the household waste disposal method by throwing waste in the open, and 192 (62%) dispose their garbage to trucks (Chikowore, 2021).

As shown in Fig. 2, plastic pollution has significant detrimental impacts on the environment and human health. Fig. 4 shows that the most dominant waste (23) in households is plastic waste, followed by organic waste (20). Thus, the research focuses on household plastic waste. The respondents' knowledge of plastic in Table 2 indicates that as many as 129 respondents confirmed that MP waste could enter the food chain and endanger humans who consume contaminated seafood. In line with this statement, 95% of the respondents stated that they knew that plastic waste harms the marine ecosystems (Charitou *et al*., 2021).

In addition, as shown in Table 2, 146 respondents are aware that plastic waste could pollute the soil, 127 respondents knew that plastic waste could pollute the air, and 100 respondents agree that plastic waste could cause problems for livestock. This study conducted a longitudinal assessment of the availability and distribution of MPs in water bodies within the urban agglomeration of Shanghai Megacity, at the watershed scale. This study examines the impact of MPs conduct on drainage systems, specifically in relation to the occurrence of overflows during wet weather flow (WWF), land utilization, and environmental management techniques. The World Wildlife Fund has the potential to significantly worsen the contamination of MPs in aquatic ecosystems. The comprehensive data analysis indicates that the annual load of MPs discharged through wastewater from their offices is approximately six times higher than the load discharged through effluent from local WWTP within the watershed. The findings of this study provide a valuable contribution to the existing body of research on the regional variability of aquatic MPs and the degree to which they are influenced by land use practices (Chen *et al*., 2020). Table 3 shows how to reduce excess plastic use; 96 respondents agreed that limiting or prohibiting the use of SUP, such as straws, plastic bags, and plastic bottles, can reduce MP pollution; 111 respondents agreed to collect plastic waste from their homes; 99 individuals agreed to sort the trash before throwing because 127 respondents believed that plastic waste would harm human health. This result was confirmed by other research,

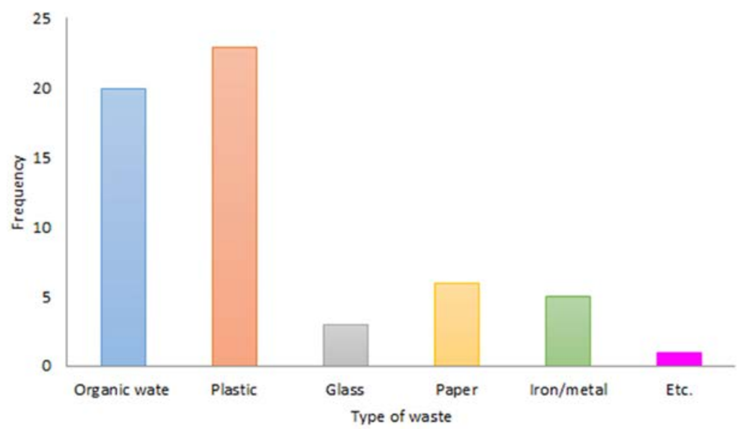

Fig. 4: Type of waste in households

explaining that 22.5% agreed that they would recycle waste (Omoyajowo *et al.*, 2021). In addition, 170 respondents participated in sorting waste from their homes prior to disposal, and 324 respondents stated that they had a perception that improper waste management contributed to the emergence of disease (Fadhullah *et al.*, 2022). Significant quantities of plastic were discovered at both sites during the course of the study. These items encompass plastic bottles, plastic cups, plastic bags, plastic sachet packaging, food wrap, and fishing nets, among other examples. Establishing a monitoring system for plastic waste leaks is imperative, and stakeholders are expected to perform the necessary repairs. Either 7.20% or 10% of the rubbish is composed of another material given the hypothetical scenario where 29.4% of waste in Bandar Lampung consists of plastic (Schmidt *et al.*, 2017). Unmanaged waste has the potential to infiltrate the marine environment, resulting in an approximate influx of 12 tons of plastic waste into the sea on a daily basis from the region of Lampung. In spite of the plastic garbage generated inside these two geographical areas, a substantial volume of waste is observed to traverse national borders. If plastic trash is not recycled and allowed to disintegrate naturally, then fragmentation and the production of MPs occur, posing significant risks to marine ecosystems (Riani and Cordova, 2022). Thus, the use of SUP should be avoided or reduced, and more environmentally friendly alternatives, such as cloth shopping bags or refillable drinking bottles, should be considered. The people can also sort waste and ensure that plastic waste is disposed appropriately to avoid polluting the rivers and the surrounding environment. The community can also participate in river and environmental cleanup programs organized by the government or local environmental organizations. Increasing public awareness about the dangers of plastic pollution and the health risks associated with consuming contaminated fish through campaigns and education can also reduce plastic pollution in rivers. Finally, the public can support government policies to reduce the use of SUP and better manage waste. These actions can reduce plastic pollution in rivers and consequently the health risks associated with consuming contaminated fish (Sabilillah *et al.*, 2023). The successful development and implementation of waste management systems by MPs heavily rely on the collaboration of multiple stakeholders. Therefore, the eradication of MPs from the environment is a multidimensional issue that necessitates a comprehensive strategy. Although no universally applicable remedy is available, advancements in catalytic processes and water treatment technologies show intriguing potential for progress. Nevertheless, further investigation and cooperation are required to develop efficient and enduring approaches for eradicating MPs and safeguarding the environment and public health. Improved waste management practices in Indonesia are urgent required to effectively mitigate the leakage of plastic trash, which has the potential to transform into MPs. Considerable emphasis should be placed on the treatment of wastewater in urban areas with high industrial activity and dense population because it plays a significant role in the pollution of water bodies by MPs. The findings of this study underscore the importance of implementing source identification and control strategies to effectively mitigate water contamination caused by MPs. The implementation of efficient waste management techniques, improved wastewater treatment methods, and the dissemination of public awareness campaigns play a crucial role in the preservation of water quality, safeguarding aquatic species, and promoting the well-being of human populations. One way to change people's behavior is to educate them about plastic pollution's health dangers. Thus, strategies should be used to be effective and optimal in providing education. Previous research outlined plans for implementing waste management in the school environment. Teachers empower and engage students to take part in environmental learning and action (Chow *et al*., 2017).

CONCLUSION

Plastic pollution increases with time. Meanwhile, controlling plastic pollution depends on user behavior. Therefore, considering the determinants of plastic user behavior, especially those related to plastic management, is essential. The present study has revealed that, to some extent, the knowledge factor exhibited a statistically significant association with household plastic waste management behavior. This finding was supported by statistical evidence, as indicated by a *p*-value of 0.002 and an OR value of 2.603. By contrast, the relationship between the attitude and action components and household plastic waste management behavior is not statistically significant, as indicated by *p*-values of 0.088 and 0.223, respectively. The regression analysis findings indicate that the knowledge variable (*p*-value = 0.000) exerts a statistically significant impact on plastic waste management behavior. In the present study, the attitude variable has yielded a *p*-value of 0.787, whereas the action variable yielded a *p*-value of 0.295. The regression coefficient value in this study is 0.356 (35.6%). The findings suggest no significant relationship between individuals' views and behavior and their behavior toward waste management, among the three independent variables. Individuals with limited awareness exhibit a 0.118-fold increase in the likelihood of engaging in inadequate domestic plastic waste management practices compared with a strong understanding. A deficiency in public awareness would have adverse implications for waste management practices within the society. This assertion holds true when the community demonstrates an apathetic stance toward trash management, which is reflected in their corresponding behavior. If an individual's behavior is deemed detrimental to waste management, then the efficiency of the waste management process is impeded. Addressing the issue of MP pollution in the environment is a multifaceted challenge that necessitates a comprehensive strategy. This scenario highlights the required fostering collaboration among multiple parties. The implementation of efficient waste management techniques, enhanced wastewater treatment methods, and the dissemination of public awareness campaigns play a pivotal role in the preservation of uncontaminated water sources and the safeguarding of aquatic species and human well-being. Hence, while knowledge, attitudes, and actions may not exhibit direct impact on individuals' behavior regarding waste management, effective plastic waste management should be prioritized to establish prudent waste management practices.

AUTHOR CONTRIBUTIONS

D. Utari prepared the manuscript text, prepared all the maps and figures, and interpretation of the results and manuscript edition. N.I Hawa performed the data analysis and performed the data analysis. G. Fizulmi permorfed the results,. H. Agustina was the corresponding author, supervising the study, obtaining funding, and conceptualization.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy have been completely observed by the authors.

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ABBREVIATIONS

%	Percent
>	More than
<	Less than
–	Until
±	Plus or minus
°C	Degree Celsius
A	Agree
BPA	Bisphenol A
CI	Confidence Interval
Cl	Convidence Level
Covid-19	Corona virus desease 2019
D	Disagree
m^3	Cubic meter
mm	Millimeters
MPs	Microplastics
N	Never
O	Often
OPs	Opportunistic pathogens
OR	Odds ratio
p-value	Probability test value
PA	Polyamide
PET	Polyethylene terephthalate
PS	Polystyrene
PVC	Polyvinyl chloride
R	Correlation coefficient
RE	Rarely
SA	Strongly agree
SD	Strongly disagree
SPSS	Statistical package for the social science
SUP	Single-use plastic
TPA	Tempat pembuangan akhir (landfills)
USD	United States Dollars
UV	Ultra Violet
VO	Very Often
WWF	Wet Weather Flow
WWTP	Wastewater Treatment Plant

REFERENCES

Akdogan, Z.; Guven, B.; Kideys, A.E., (2023). Microplastic distribution in the surface water and sediment of the Ergene River. Environ. Res., 234: 116500 **(11 pages).**

Ali, F.; Azmi, K.N.; Firdaus, M.R., (2021). Existence of microplastics in Indonesia's surface water: A review. Int. J. Intgr. Eng., 13(3): 100–107 **(8 pages).**

Anderson, J.C.; Park, B.J.; Palace, V.P., (2016). Microplastics in aquatic environments: Implications for Canadian ecosystems. Environ. Pollut., 218: 269–280 **(12 pages).**

Arpia, A.A.; Chen, W.H.; Ubando, A.T.; Naqvi, S.R.; Culaba, A.B., (2021). Microplastic degradation as a sustainable concurrent approach for producing biofuel and obliterating hazardous environmental effects: A state-of-the-art review. J. Hazard. Mater., 418: 126381 **(11 pages).**

Buwono, N.R.; Risjani, Y.; Soegianto, A., (2022). Spatio-temporal patterns of occurrence of microplastics in the freshwater fish Gambusia affinis from the Brantas River, Indonesia. Environ. Pollut., 311: 119958 **(32 pages).**

Cerasi, I.R.; Sánchez, F.V.; Gallardo, I.; Górriz, M.Á.; Torrijos, P.; Aliaga, C.; Franco, J., (2021). Household plastic waste habits and attitudes: A pilot study in the city of Valencia. Waste Manage. Res., 39(5): 679-689 **(11 pages).**

Charitou, A.; Aga-Spyridopoulou, R.N.; Mylona, Z.; Beck, R.; McLellan, F.; Addamo, A. M., (2021). Investigating the knowledge and attitude of the Greek public towards marine plastic pollution and the EU single-use plastics directive. Mar. Pollut. Bull., 166: 112182 **(11 pages)**.

Chen, H.; Jia, Q.; Zhao, X.; Li, L.; Nie, Y.; Liu, H.; Ye, J., (2020). The occurrence of microplastics in water bodies in urban agglomerations: Impacts of drainage system overflow in wet weather, catchment land-uses, and environmental management practices. Water Res., 183: 116073 **(1 page).**

Chen, X.; Tao, G.; Wang, Y.; Wei, W.; Lian, X.; Shi, Y.; Chen, S.; Sun, Y., (2022). Interactive impacts of microplastics and chlorine on biological stability and microbial community formation in stagnant water. Water Res., 221 **(23 pages).**

Chen, X.; Lian, X.; Wang, Y.; Chen, S.; Sun, Y.; Tao, G.; Tan, Q.; Feng, J., (2023). Impacts of hydraulic conditions on microplastics biofilm development, shear stresses distribution, and microbial community structures in drinking water distribution pipes. J. Environ. Manage., 325: 116510 **(13 pages).**

Chikowore, N., (2021). Factors influencing household waste management practices in Zimbabwe. J. Mater. Cycles Waste Manage., 23(1): 386-393 **(8 pages).**

Choudhury, M.; Sahoo, S.; Samanta, P.; Tiwari, A.; Tiwari, A.; Chadha, U.; Bhardwaj, P.; Nalluri, A.; Eticha, T.K.; Chakravorty, A., (2022). COVID-19: An accelerator for global plastic consumption and its implications. J. Environ. Public Health, 2022: 1066350 **(17 pages).**

Chow, C.F.; So, W.M.W.; Cheung, T.Y., Yeung, S.K.D., (2017). Plastic waste problem and education for plastic waste management. (eds) Emerging Practices in Scholarship of Learning and Teaching in a Digital Era. Springer, Singapore **(16 pages).**

Cordova, M.R.; Iskandar, M.R.; Muhtadi, A.; Saville, R.; Riani, E., (2022). Spatio-temporal variation and seasonal dynamics of stranded beach anthropogenic debris on Indonesian beach from the results of nationwide monitoring. Mar. Pollut. Bull., 182: 114035 **(3 pages).**

Costa, L.L.; da Silva Oliveira, A.; da Costa, I.D.; Silva, T.N.; Sant'Anna, M.E.A.S.; Tavares, B.; Zalmon, I.R., (2023). Multiple species ingest microplastic but few reflect sediment and water pollution on sandy beaches: A baseline for biomonitoring. Mar. Pollut. Bull., 193: 115235 **(1 page).**

Deng, L.; Cai, L.; Sun, F.; Li, G.; Che, Y., (2020). Public attitudes towards microplastics: Perceptions, behaviors and policy implications. Resour. Conserv. Recycl., 163: 105096 **(11 pages).**

Devereux, R.; Ayati, B.; Westhead, E.K.; Jayaratne, R.; Newport, D., (2023). Impact of the Covid-19 pandemic on microplastic abundance along the River Thames. Mar. Pollut. Bull., 189: 114763 **(13 pages).**

Diez-Pérez, D.B.; Arenas, I.; Maidana, E.; López-Rosales, A.; Andrade, J.M.; Muniategui-Lorenzo, S., (2023). Microplastics in surface water of the Bay of Asunción, Paraguay. Mar. Pollut. Bull., 192: 115075 **(11 pages).**

Enfrin, M.; Dumée, L.F.; Lee, J., (2019). Nano/microplastics in water and wastewater treatment processes–origin, impact and potential solutions. Water Res., 161: 621-638 **(78 pages).**

Fadhullah, W.; Imran, N.I.N.; Ismail, S.N.S.; Jaafar, M.H.; Abdullah, H., (2022). Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. BMC Public Health, 22(1): 1-20 **(20 pages).**

Garello, N.A.; Blettler, M.C.M.; Espínola, L.A.; Rodrigues, S.; Rimondino, G.N.; Wantzen, K.M.; Rabuffetti, A.P.; Girard, P.; Malanca, F.E., (2023). Microplastics distribution in river side bars: The combined effects of water level and wind intensity. Sci. Total Environ., 165406 **(1 page).**

Guzzetti, E.; Sureda, A.; Tejada, S.; Faggio, C., (2018). Microplastic in marine organism: Environmental and toxicological effects. Environ. Toxicol. Pharmacol., 64: 164-171 **(8 pages).**

Jahani, A.; Dehdari, T.; Farzadkia, M.; Mansourian, M., (2019). Iranian experiences in terms of consumption of disposable single-use plastics: Introduction to theoretical variables for developing environmental health promotion efforts. Environ. Toxicol. Pharmacol., 65: 18–22 **(5 pages).**

Karbassi, A.R.; Pazoki, M., (2015). Environmental Qualitative assessment of rivers sediments . Global J. Environ. Sci. Manage., 1 (2): 109-116 **(8 pages).**

Katyal, D.; Kong, E.; Villanueva, J., (2020). Microplastics in the environment: impact on human health and future mitigation strategies. Environ. Health Rev., 63(1): 27-31 **(5 pages).**

Koumi, A.R.; Ouattara-Soro, F.S.; Quéré, Y.; Louault, Y.; N'cho, A.J.Y.; Coulibaly, S.; Cecchi, P., (2021). Les déchets plastiques dans l'océan au cœur de l'Aquathon d'Abidjan, Côte d'Ivoire, Plastic waste in the ocean at the core of the Aquathon meeting in Abidjan, Ivory Coast. Nat. Sci. Soc., 29(4): 458-468. **(11 pages).**

Kumar, R.; Verma, A.; Shome, A.; Sinha, R.; Sinha, S.; Jha, P.K.; Prasad, P.V.P., (2021). Impacts of plastic pollution on ecosystem services, sustainable development goals, and need to focus on circular economy and policy interventions. Sustainability. 13(17): 9963 **(40 pages).**

Mihai, F.C.; Gündoğdu, S.; Markley, L.A.; Olivelli, A.; Khan, F.R.; Gwinnett, C.; Molinos-Senante, M., (2021). Plastic pollution, waste management issues, and circular economy opportunities in rural communities. Sustainability, 14(1): 20 **(48 pages).**

Oguge, N.; Oremo, F.; Adhiambo, S., (2021). Investigating the knowledge and attitudes towards plastic pollution among the youth in Nairobi, Kenya. Social Sci., 10(11): 408 **(13 pages).**

Okunola, A.A.; Kehinde, I.O.; Oluwaseun, A.; Olufiropo E.A., (2019). Public and environmental health effects of plastic wastes disposal: A review. J. Toxicol. Risk Assess., 5(1): 021 **(13 pages).**

Omoyajowo, K.; Raimi, M.; Waleola, T.; Odipe, O.; Ogunyebi, A., (2021). Public awareness, knowledge, attitude and perception on microplastics pollution around lagos lagoon. Ecol. Saf. Balanced Use of Resour., 2(24): 35-46 **(12 pages).**

Rahmawati, A., (2023). Mikroplastik: wujudnya tak nampak dan dampaknya tak terduga. Kementrian Kesehatan Republik Indonesia.

Raja, K.; Bhakta, H.; Prakash, V.; Samal, B.; Bhattacharya, J., (2020). Challenges and strategies for effective plastic waste management during and post Covid-19 pandemic. Sci. Total Environ., 750: 141514 **(10 pages).**

Riani, E.; Cordova, M.R., (2022). Microplastic ingestion by the sandfish Holothuria scabra in Lampung and Sumbawa, Indonesia. Mar. Pollut. Bull., 175: 113134 **(8 page).**

Saat, N.Z.M.; Hanawi, S.A.; Subhi, N.; Zulfakar, S.S.; Wahab, M.I.A., (2018). Practice and attitude on household waste management in Tumpat and Kuala Krai, Kelantan. Res. J. Soc. Sci., 11(1): 14-17 **(4 pages).**

Sabilillah, A.M.; Palupi, F.R.; Adji, B.K.; Nugroho, A.P., (2023). Health risk assessment and microplastic pollution in streams through accumulation and interaction by heavy metals. Global J. Environ. Sci. Manage., 9(4): 719-740 **(22 pages).**

Samimi, M.; Moghadam, H., (2024). Investigation of structural parameters for inclined weir-type solar stills, Renew. Sustain. Energy Rev., 190: 113969 **(10 pages).**

Sarkodie, S.A.; Owusu, P.A., (2021). Impact of COVID-19 pandemic on waste management. Environ. Dev. Sustainability, 23: 7951-7960 **(10 pages).**

Schmidt, C.; Krauth, T.; Wagner, S., (2017). Export of plastic debris by rivers into the sea. Environ. Sci. Technol., 51(21): 12246-12253 **(8 pages).**

Sloop, G.D.; De Mast, Q.; Pop, G.; Weidman, J.J.; Cyr, J.A.S., (2020). The role of blood viscosity in infectious diseases. Cureus, 12(2): e7090 **(8 pages).**

Stead, J.L.; Bond, T., (2023). The impact of riverine particles on the vertical velocities of large microplastics. Sci. Total Environ., 896: 165339 **(9 pages).**

Thanh, N.P.; Matsui, Y.; Fujiwara, T., (2011). Assessment of plastic waste generation and its potential recycling of household solid waste in Can Tho City, Vietnam. Environ. Monit. Assess., 175: 23-35 **(13 pages).**

Van Rensburg, M.L.; Nkomo, S.L.; Dube, T., (2020). The 'plastic waste era': Social perceptions towards single-use plastic consumption and impacts on the marine environment in Durban, South Africa. Appl. Geogr., 114(May 2019): 102132 **(9 pages).**

Velmurugan, P.M.; Vijayaprabhakaran, K.; Devika, P.T., (2023). Baseline study on identification, characterization, distribution and abundance of microplastics in surface water from Ennore to Kovalam along the east coast of India. Phys. Chem. Earth, Parts A/B/C, 13: 103391 **(6 pages).**

Wu, J.; Ye, Q.; Sun, L.; Liu, J.; Huang, M.; Wang, T.; Wu, P.; Zhu, N., (2023). Impact of persistent rain on microplastics distribution and plastisphere community: A field study in the Pearl River, China. Sci. Total Environ., 879: 163066 **(13 pages).**

Yang, S.; Zhou, M.; Chen, X.; Hu, L.; Xu, Y.; Fu, W.; Li, C., (2022). A comparative review of microplastics in lake systems from different countries and regions. Chemosphere, 286: 131806 **(13 pages).**

Yee, M.S.L.; Hii, L.W.; Looi, C.K.; Lim, W.M.; Wong, S.F.; Kok, Y.Y.; Tan, B.K.; Wong, C.Y.; Leong, C.O., (2021). Impact of microplastics and nanoplastics on human health. Nanomaterials, 11(2): 496 **(22 pages).**

Yuan, D.; Corvianawatie, C.; Cordova, M.R.; Surinati, D.; Li, Y.; Wang, Z.; Li, X.; Li, R.; Wang, J.; He, L.; Yuan, A.N.; Dirhamsyah, D.; Arifin, Z.; Sun, X.; Isobe, A., (2023). Microplastics in the tropical Northwestern Pacific Ocean and the Indonesian seas. J. Sea Res., 102406 **(9 pages).**

Zhang, S.; Hu, D.; Lin, T.; Li, W.; Zhao, R.; Yang, H.; Jiang, L., (2021). Determinants affecting residents' waste classification intention and behavior: A study based on TPB and ABC methodology. J. Environ. Manage., 290: 112591 **(7 pages).**

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