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ESTIMATION OF POTENTIAL LEAKS AND BRANDS OF MARINE DEBRIS PRODUCTS FROM FISHING VESSEL OPERATIONS : CASE STUDY OF TEGALSARI FISHING PORT



ACRONYMS AND ABBREVIATIONS

ABK/AWK	Fishing Vessel Crews
ABPI	Fishing Aids
API	Fishing Gear
B3	Hazardous and Toxic Materials
CV	Commanditaire Vennootschap
FMCG	Fast-Moving Consumer Goods
GT	Gross Tonnage
Permenhub	Minister of Transportation Regulation
Permen LHK	Minister of Environment and Forestry Regulations
PPP	Fishing Port
PT	Perseroan Terbatas
UD	Usaha Dagang
UPT	Technical Implementation Unit
WPPNRI	State Fisheries Management Area of the Republic of Indonesia

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SUMMARY

The issue of plastic marine contamination has attracted the most attention globally. In the deepest ocean trench and in enormous terrestrial ecosystems, plastic waste has been discovered. Indonesia is one of the most polluting nations in the world, where plastic waste leaks into the ocean and accounted for 17% of all waste produced in the country by 2020. Fishing and passenger vessel operations were said to have released 12,785 tons of waste during the same year. The earlier study conducted by DFW Indonesia, titled Quick Assessment Study on Status and Management of Waste at Tegalsari Fishing Port, discovered that fishing activities, including vessel loading and unloading, docking, and fishing, contributed to the marine plastic pollution. The study has established critical groundwork for understanding the quantity and make-up of waste generated by each fishing vessel as well as the possibility of plastic waste leakage from fishing operations into the WPPNRI. Even so, because the study only used a small number of samples, it failed to stratify the samples, which caused data overlap. Consequently, the study was unable to yield high-quality results. Additionally, the study did not examine specific brands of plastic marine contamination, making it challenging to hold producers accountable for their plastics. The actual execution of waste management onboard was not also seen, which made the role of fisherman in waste management on vessels less well understood. The study's weaknesses must then be corrected in order to achieve results of the highest calibre. This extensive study seeks to contribute to the provision and improvement of data and information about the estimation of leaks and brands of marine waste products from WPPNRI fishing activities.

This study included a descriptive quantitative methodology, as well as survey and observation approaches. This investigation saw 104 fishing vessels docked at the pool and prepared to depart, including 83 fishermen and vessel agents from vessels > 30 GT and 21 fishermen from vessels ≤ 30 GT. This study shows that PPP Tegalsari fishing vessels > 30 GT generated 31.7 kg of plastic waste per trip, while fishing vessels ≤ 30 GT generated 22.5 kg of waste per trip. Approximately 87.8 percent of plastic waste dumped into the sea, with beverage packaging accounting for the majority of plastic waste (68 %). Only around 15% of the plastic waste was returned to the port. The majority of the material thrown into the river was multi-layer plastics or sachets. The three highest plastic contributor brands to the ocean by weight were Adi brand bottled mineral water (10.3 kg/ship/trip), Prim-A brand mineral water (3.4 kg), and Sprite (1.98 kg). Gudang Garam red cigarettes (1,905 packs), Mie Sedaap (1,125 packs), and Masako flavouring (777 packs) were the three most significant brands in terms of waste contribution to the sea. PT Tirta Adi Sejahtera was the company that contributes the most to the weight of plastic waste entering the sea from only one product brand, followed by PT Coca Cola Bottling Indonesia with 4 brands and Wings Group with 9 brands. The three largest corporations in terms of plastic waste to the ocean are PT Gudang Garam (2 brands), Wings Group, and Indofood CBP Sukses Makmur (5 brands). Only 20.2% of PPP Tegalsari fishing vessels collected waste and 8.7% sorted waste, with the major cause driving this behaviour being a lack of supporting facilities. Multinational corporations such as Coca-Cola, Unilever, Otsuka, and Frisian Flag have a clearer role to play in achieving the global goal of contributing to waste reduction under the requirements of Permen LHK No. 75/2019. National companies, with the exception of Indofood, were found to lack defined aims largely connected to plastic reduction initiatives in the pre- and post-consumption stages.

The study adds to the body of knowledge about how large and small vessels contribute to the entrance of plastic debris into the sea. This study demonstrates that the SOP for handling waste on fishing vessels must be adopted quickly, not only in Tegalsari Fishing Port, but also in other fishing ports in Indonesia, in order to effectively prevent considerable amounts of plastics leaking into the ocean. This study also shows that all producers, not just the larger and multinational ones, must develop a plan to reduce plastics at the early stages of manufacturing and at the end of consumption.

1 INTRODUCTION

1.1 BACKGROUND

Marine debris has been recognized as a global phenomenon, along with other environmental issues such as climate change, ocean acidification, and biodiversity loss (Sutherland et al., 2021). Plastic waste as the main component of marine debris receives special attention from the world because of its abundant, durable and consistent nature (Gall and Thompson, 2015). Plastic waste in the ocean has received important attention in recent years, as seen from various meetings of the UN, G7 and G20 organizations, the UN, APEC, and national and local governments, as well as non-governmental organizations in various parts of the world launching programs to contribute to the managing of plastic waste.

Plastic waste of varying sizes in the ocean has been found in remote places in the world's oceans in most coastlines and in terrestrial ecosystems (Thompson et al., 2009; Vince and Stoett, 2018). Around 14 million tons of plastic leak into the sea every year, mainly in tourist and densely populated areas (IUCN, 2021). About 3/4 of the world's marine debris is plastic waste found to pollute the north pole and south pole to the equator and from coastlines to the deep sea (Barnes et al., 2009).

One of the nations that considerably contributes to the leaking of plastic waste into the ocean is Indonesia. The Indonesian Ministry of Environment and Forestry in Aditya (2020) stated that the total national waste generation in 2020 reached 67.8 million tons with plastic waste accounting for 17% of that total. Due to an increase in plastic production in the food, beverage and other industries, Indonesia has seen a 6% increase in plastic waste output over the past ten years. A total of 521,540 tons of waste were anticipated to reach Indonesian waters in 2020, of which 12,785 tons were the result of marine activities, including fishing and passenger vessel operations (Hendiarti in Sucahyo, 2021). These figures indicate that the amount of plastic waste that is said to be released into the ocean as a result of marine debris is only 2.45 percent. However, because the assessment did not take into account more important influencing elements, more study is still required. Therefore, in order to gather better data, a more thorough investigation that particularly evaluates the possibility of waste leaking into the ocean from fishing vessel activities in Indonesia is required.

Ecosystems, marine life, and the environment are all negatively impacted by marine debris. Plastics in the ocean endanger marine and human life, damage commercial fishing and

vesselling equipment, and help spread organic and inorganic pollution ([Barnes et al., 2009](#)). Marine ecosystems such as mangroves, seagrass beds and coral reefs, according to [Assuyuti et al., \(2018\)](#) have also been polluted by waste in the form of both solid waste and liquid waste from community activities on land. The same study states that plastic waste has been found in coral reef ecosystems on Pramuka Island, Panggang Island and Water Island in the Thousand Islands of Jakarta with an average hard coral cover of > 30%, where the amount of waste increases along with the closure of hard and dead corals at a depth of three meters. [Putra et al., \(2021\)](#) further reported that plastic waste was also found in coral reef ecosystems on Dua Island, Harapan Island and Kelapa Island which are within the same archipelago, namely the Seribu Islands.

In Indonesia, it is nevertheless challenging to locate measurements of marine debris estimates from fishing operations in the sea along with brand evaluations of supply products. Two previous studies from [Abdurrahman \(2021\)](#) and [Kholipah Rahman \(2021\)](#) at the Nizam Zachman and Cilacap Fishing Port provide an overview of waste generation from human consumption consumables and non-human consumables for machinery and fishing, especially on the Gill Net. The two investigations, however, did not evaluate the manufacturer of the fishermen's equipment, therefore detailed data on the kind of plastic packaging that spilled into the sea was not gathered. Lack of such data did not give compelling proof that manufacturers must participate in limited liability companies' social (CSR) in accordance with [PP No. 47/2012](#) and the social and environmental responsibility of State-Owned Enterprises in accordance with the provisions of [the Minister of State-Owned Enterprises Per-05 / MBU / 04/2021](#)) related to the problem of plastic waste in the ocean. The Break Free Plastic program has carried out regular brand audits in various countries including Indonesia ([Greenpeace USA, 2018](#)). The initiative, however, has not been able to address the issue of plastic waste from fishermen's brand products in fishing operations in Indonesia's seas since it follows the concept of a clean-up movement with the major focus on assessing waste in coastal areas. In order to determine the pattern of plastic waste entering the sea via direct disposal by fishermen during the fishing operation period, research on the estimation of waste leakage into the sea is required, along with brand assessments of supply products from fishing vessel activities.

1.2 AIM OF THE STUDY

The purpose of this study on the assessment of the potential of marine debris and product brands from fishing vessel operations is to contribute to the provision and improvement of data and information regarding the estimation of leaks and brands of marine debris products from fishing operations at WPPNRI through identification of plastic waste generation, brands and

manufactures of marine supplies products as well as waste handling in fishing at fishermen of Tegalsari Fishing Port.

1.3 METHODS

This study applies descriptive quantitative methods with a survey approach. The descriptive quantitative method is used because it helps explain social and natural events so as to provide an overview of the results of more complex studies (Punaji, 2010). Descriptive methods through interrelated variables seek to clarify the social symptoms found in society (Widodo and Mukhtar, 2000). Assessment of the potential waste from fishermen's supplies from fishing activities requires detailed depiction so that conclusions can be drawn on an ongoing basis from the results of the study.

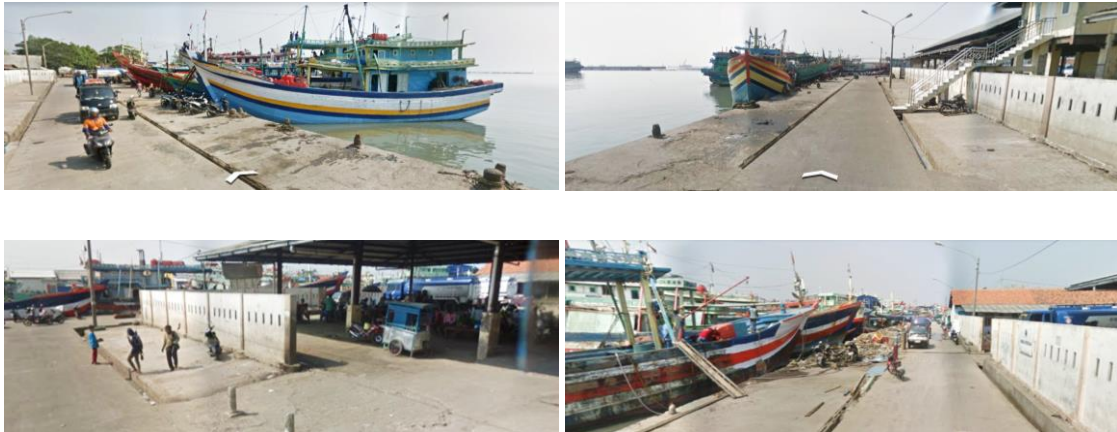
Descriptive methods develop a foundation for finding new facts and provide a knowledge base that can be a parameter for further quantitative analysis, where most are guided by one or more research questions and often do not follow structured research hypotheses (Travers, 1978). This study is a follow-up study of the Quick Assessment activity carried out in June 2021. The study was used to develop research questions in the questionnaires. This study is believed to provide new and detailed data and information about the leakage of plastic waste from fishing ports, especially Type C Fishing Ports in Indonesia which can be adopted in other fishing ports. The study of assessing the potential of marine debris and product brands from Indonesian fishing vessel operations did not develop a hypothesis because it would only understand the weight / volume of waste and the brand of plastic products packaging waste from fishing activities at sea.

Nazir (2003) defines a survey as an investigation of the facts of existing symptoms and seeking factual information from a group of respondents. This approach seeks to understand the problem and obtain justification for the ongoing practice (Nazir, 2003). The survey approach in this study aims to identify supplies and procedures for handling fishermen's waste on fishing vessels using questionnaires so that conclusions can be drawn about the estimated weight / volume of waste and product brands entering the sea from fishing activities.

1.3.1 Activity Location and Time

The study of the potential of marine debris from fishing vessel operations in Indonesia was carried out at one of the largest fishing ports in Central Java Province, namely the Tegalsari Fishing Port located in Tegalsari Village, West Tegal District, Tegal City, Central Java Province. This study consisted of being carried out in the capture fisheries industrial area in Block E of PPP Tegalsari which consists of the Jongor Fish Auction, mooring dock, vessel supplies and

repair docks as well as on fishing vessels. This activity will be held for three days, starting from 15 March 2022 to 18 March 2022.



Source: Google Earth, 2022

1.3.2 Population and Study Samples

The population in this study includes 958 fishing vessels that are active and based at the Tegalsari Fishing Port. Sampling is carried out in a stratified random sampling. Yamane (1967) defined that the technique divides the population into strata, then randomly selects a sample from each stratum and combines it into sample groups to assess population parameters. This technique selects cross-section samples better compared to non-stratified populations and provides great justification for estimating population characteristics.

The sample group studied in this study was divided into two vessel size classes, namely vessels with a size of < 30 Gross Tonnage (GT) and vessels with a size of > 30 GT. There are as many as 515 vessels < size 30 GT and 443 vessels measuring > 30 GT (UPT PPP Tegalsari, 2020). The calculation of the sample size uses the following formula.

$$\text{Sample size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \frac{z^2 \times p(1-p)}{e^2 N}}$$

z = Z value; p = standard deviation; e = margin of error and N = total population

The confidence level used to determine the sample size is 90%, which means that the selected sample is believed to be able to describe the entire population according to the margin of error at a range of +10%. The error limit is selected based on the assumption that the characteristics of the vessel's population are heterogeneous so that it can be influenced by various confounding variables. Based on the calculation, it was found that the number of samples for

vessels of size < 30 GT, which is 21 vessels and for vessels of > size of 30 GT, which is 83 total vessels.

1.3.3 Study Framework

This study utilised a descriptive quantitative technique with a closed-ended questionnaire instrument. The technique was selected to convey numerical and descriptive statistics such as the weight, quantity, and composition of plastic waste generated and thrown to the sea by fishing vessels. As descriptive quantitative study is primarily focused with "what rather" than "why" or "how" questions, observation and survey instruments are the best choices to obtain data (Gall et al., 2007). The technic utilised in this study is identical to that used in the preceding study, with the exception of the contents of a questionnaire. This study employed closed-ended question surveys to obtain thorough information on fishermen's supply by product group in order to reduce confounding variables that might alter the final findings of marine debris computations.

This study assessed fishermen's fishing supplies and waste handling on PPP Tegalsari capture fishing vessels operating in the Fisheries Management Area. The supplies to be assessed include food, drinks, toiletries and fishing supplies. Consumption includes all consumables that fishermen use every day during the sailing and fishing period such as snacks, flavourings, sugar, mineral water, coffee, tea, shampoo, soap, medicines and so on. Fishing supplies include Fishing Equipment (API) and Fishing Aids (ABPI) such as nets, ropes and others. The number and brand of supplies are investigated to obtain waste generation results in each fishing vessel based on the size of the vessel, the composition of plastic waste, type / brand of products that are widely used by fishermen on the PPP Tegalsari fishing vessel. Furthermore, the handling of waste on fishing vessels measures the presence of disaggregated waste bins on the vessel and the return of waste to the port. The results of the waste handling assessment provided an overview of the names of companies contributing to marine plastic waste, estimates of plastic waste leakage into the sea and the composition and amount of waste brought back to land.

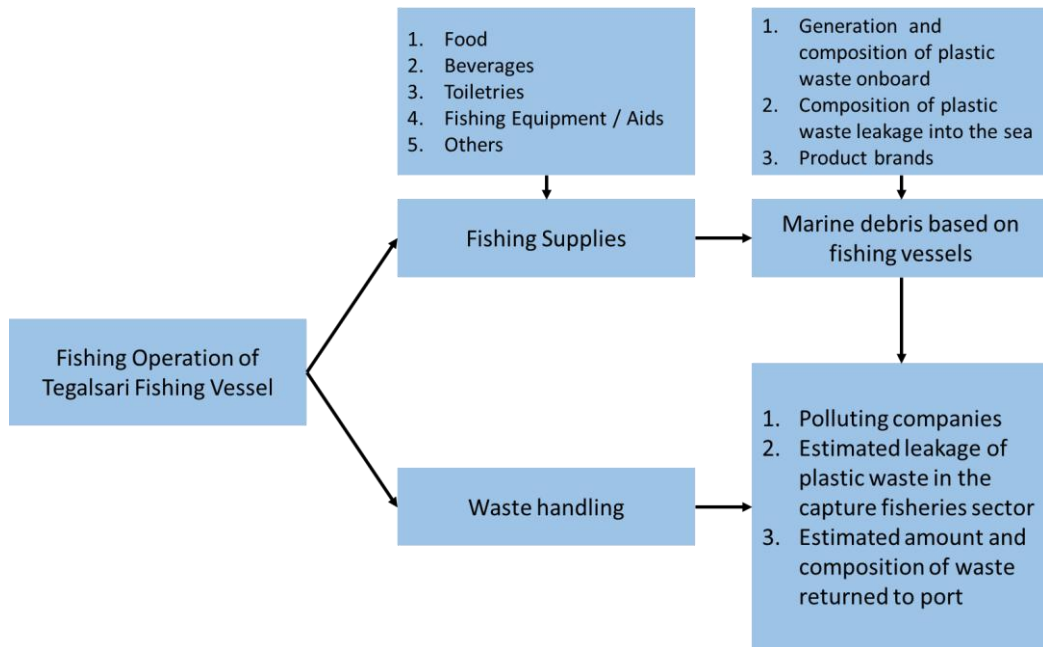


Figure 1. Framework for Studying the Potential for Leakage of Plastic Waste and Brands of Marine Debris from Fishing Vessel Operations

2 RESULTS AND DISCUSSIONS

2.1 Socio-Demographics of Fishermen

Captain and vessel agents are groups involved in the "Study of Waste Potential from Fishermen's Supplies and Product Audit Brand" at the Tegalsari Fishing Port. The composition is 91 people (87.5%) vessel agents and 13 people are captains. The two groups are mostly domiciled in Tegal City, and a small part is domiciled in Tegal and Brebes.

Vessel agents have a vital role in preparing and ensuring fishermen's supplies products are in accordance with the sea needs of all Fishing Vessel Crews (AWK) for a certain duration of the trip or completing the needs of Captain and Crew (ABK) regarding rationing. vessel agents are also in charge of reporting vessel arrivals and departures, submitting vessel documents to *kesyahbandaran*, carrying out port services, completing vessel documents that expire at the expense of vessel owners and providing related information to vessel owners ([Permenhub No. PM 65/2019](#)). Vessel captain is defined in [Law No. 17/2008](#) as the highest leader on the vessel who has the authority and responsibility in accordance with the provisions of the legislation. Some of the duties of the vessel's captain are to ensure that the vessel 's seaworthiness is in accordance with its vesselping area which includes prevention of pollution from the vessel, safety management and prevention of pollution from the vessel.

Captain and vessel agents at PPP Tegalsari have varying lengths of service and level of education. The period of service is the length of work of fishermen in the scope of work which is calculated in units of months and years. The period of service is the length of work of fishermen in the scope of work which is calculated in units of months and years. Fishermen have a service life ranging from 6 months to 40 years. Fishermen who have a high service life usually change vessels frequently after one period of fishing operations is completed. Fishermen change vessels depending on where they are recruited and/or needed by the captain. With regard to the level of education, both groups have a low level of education, characterized by a high percentage of fishermen who only complete formal education up to the junior high school level ([Yuniarta and Suharto, \(2011\)](#); [Lara and Hidajah \(2016\)](#); [Rosidi and Sulistyowati \(2012\)](#)), where the majority of respondents only finished elementary school (50%), followed by the embedding of Junior High School (12.5%). Only 27 respondents completed high school education, and only two people completed higher education at the university level.

Fishermen who did not go to school are in the age range of 30 years – 55 years and did not go to school to only finish elementary school has not been in line with the implementation of compulsory education which has been initiated since 1984 ([Kompas, 2021](#)), which is formulated in [Law No. 20/2003](#). The regulation stipulates compulsory education followed by children aged seven to fifteen. The low education of fishermen is caused by economic factors and lack of knowledge about the benefits of education. These two factors are also confirmed by [Dewi et al., \(2014\)](#) as factors of children dropping out of school at an educational age along with the lack of attention of parents, learning facilities, culture and school location.

2.2 Fishing Vessel Profile

The fishing vessels involved in this study consisted of 83 units of large-sized vessels > 30 GT and 21 units of small-sized vessels < 30 GT. GT shows the large volume of vessels to accommodate the results of fishing operations in the context of utilizing fishery resources ([Sunardi et al., 2019](#)). The grouping of vessels into two classes is adjusted to the licensing authority of fishing vessels. The < 30 GT size vessel has a Provincial Government permit while the > 30 GT size vessel is the responsibility of the Central Government.

The 30 GT > vessels were preferred more in this study, although the number of small-sized vessels was larger, as it was driven by the need to implement sops for preventing marine debris leakage from fishing vessels that were woven for large vessels, due to the larger number of crew members and the longer trip duration. Data from [UPT PPP Tegalsari \(2020\)](#) shows that a number of vessels are marking down the size of the vessel, so that the number of small-sized vessels looks more than the size of large vessels. This is done because of the difference in fees that must be paid by large vessels. [Sunardi et al., \(2019\)](#) stated that the value of GT affects policies, permits, costs and subsidized fuel rations ([Presidential Regulation No. 191/2014](#)).

The PPP Tegalsari fishing vessel has a variety of crews, depending on the number of crew members, the duration of the sea and the fishing gear. In this study, it was found that large-sized vessels have fishing vessel crews ranging from 14 people to 40 people with a trip duration of 30 days to more than 90 days, while small-sized vessels have a crew of 4 people to 37 people with trip durations between one day to more than 90 days. Furthermore, the standard number of Indonesian fishing vessel crews, claimed by PPP Tegalsari fishermen, for the Cantrang vessel is 22 people, for the Purse Seine, which is 35 people and for the Bouke Ami, which is 14 people. The Purse Seine vessel requires more crew than the Cantrang vessel and the Bouke Ami vessel because it uses manual fishing gear to help pull and stretch the circular net. On the other hand, the Bouke Ami vessel has the least number of AWK due to the use of nets that do not require

large power in its operation, although the duration of the trip of this vessel is relatively long, that is, on average, > 90 days.

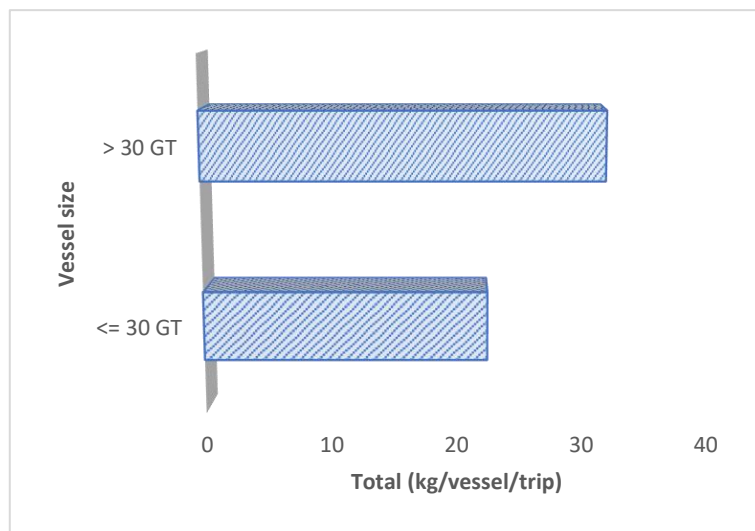
2.3 Plastic Waste Generation and Potential Leakage from Fishermen's Supplies

2.3.1 Plastic Waste Generation and Composition

Plastic waste generation is the weight or volume of plastic waste generated at the source. Waste generation is obtained from the division between the weight of the measured waste (kg) and the number of wastes producing units (vessels). The calculation of plastic waste generation on the Tegalsari PPP fishing vessel provides an overview of the large number of remaining plastic packaging supplies that have a great potential to enter the sea from fishing vessels without proper handling.

The waste produced by fishing vessels measuring < 30 GT and fishing vessels measuring > 30 GT have a much different weight so to find out the average (\bar{x}) of waste of a certain size requires separate calculations. Waste generation from fishing vessels < 30 GT divided by 21, while fishing vessel waste generation > 30 GT divided by 83 according to the composition of respondents.

There is a total of 54.2 kg of plastic waste generated in each PPP Tegalsari fishing vessel. Each vessel measuring > 30 GT generated a total of 31.7 kg of plastic waste or equivalent to 59.2% of the total plastic waste on the vessel, while the rest were contributed by vessel measuring \leq 30 GT.



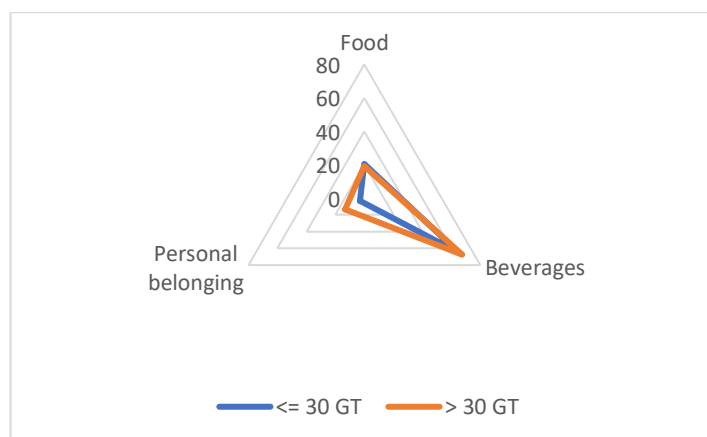
Graph 1. Generation of Plastic Waste on Each Tegalsari Fishing Vessel

The challenge of gathering data drove the categorization of fishermen's supplies into three classes rather than five classes according to the conceptual framework. Only a few of the fishermen were aware, and only a few of the vessel's agents were willing to offer information

on the quantity of net, ropes, fish plastic, oil, and other vessel equipment transported to sea during fishing operations. This information is also difficult to gather from sight because the ropes and nets are often piled and difficult to separate and calculate manually. In addition, plastic fish have also been put in sacks and are not allowed to be opened. Oil is generally stored at the bottom of the vessel so calculations are also difficult. Then, other equipment such as medicine is not included in the supplies provided by the management, so to record the number of supplies brought, interviews and observations are needed with each fishing vessel crew. This is not effective to do because it requires more time and resources. Waste from fishermen's toiletries did not have a significant amount so that combining toiletries and other supplies into fishermen's personal supplies is seen as a better thing to do. The number of supplies and plastic waste from API/ABPI in this study was not found, so further studies specifically to calculate the related waste need to be carried out.

The composition of plastic waste is calculated by dividing the quantity of waste generated by category (food/beverage/personal equipment) by the total amount of plastic waste generated on board of each vessel class. As the primary focus of this study is on plastic waste, the generation of waste on board from other waste types, including organic, iron, glass, and B3 waste, was not taken into account. This stimulates the computation of the composition of plastic waste in the cluster of food supplies, beverages, and personal equipment used by fisherman.

The amount of plastic waste created in each PPP Tegalsari fishing vessel is directly related to the generation of the plastic waste. Beverage supplies accounted for the majority of plastic waste aboard vessels, including leaking into the sea, accounting for more than 65 percent in fishing vessels of 30 GT and greater. Food supplies are the second greatest producer of plastic waste, contributing for 2x more than personal supplies on larger vessels than 30 GT and 1.5 times more than personal supplies on vessels less than 30 GT.



Graph 2. Composition of Plastic Waste on Each Tegalsari Fishing Vessel

The above waste generation is only obtained from the remaining packaging of human supplies, namely food, drinks and personal equipment, but does not include the remaining vessel consumption. The difficulty of obtaining data from 104 captain and vessel agents due to low awareness and sensitive issues of certain questions resulted in the absence of information regarding the composition of APIs and ABPI on marine debris. Fish plastic is usually stored in sacks and purchased kilos, so both crew members and vessel agents lack information about the number of plastic sheets of fish carried. This hinders the calculation of the weight of fish plastic waste per item. Then, with regard to nets and diving ropes, not all fishermen want to provide information about the number of APIs and ABPI because fishing gear is a sensitive issue that can be avoided as much as possible. Another limitation is that the vessel's agent and captain are not willing to provide receipts or shopping lists of supplies because they are company secrets. Observations of nets and ropes are also difficult to carry out due to the accumulation of items with large quantities in one place. Due to the above conditions, this study only explains the problem of waste from human consumption supplies without discussing vessel consumption supplies.

Supplies that have the potential to produce marine-based plastic waste are divided into three categories, namely food, beverages and personal equipment. The types of products that are considered to produce plastic waste in the food supply category include snacks, flavourings, salt, sugar, soy sauce, sauce / chili sauce, flour, tofu, tempeh, instant noodles and seasonings, cooking oil, coconut milk powder, sacks and jerry cans. Types of products in the category of personal equipment that are known to produce plastic waste are soap, detergent, shampoo, toothpaste, toothbrushes and medicines. The types of products that are then assessed to produce plastic waste in the category of beverage supplies are mineral water, coffee, tea, milk and soft drinks. The five types of products that contribute the largest amount of plastic waste after mineral water in the fishing period for large and small vessels are soft drinks with an average weight of 8.5 kg, instant noodles 4.3 kg, jerry cans 2.8 kg, cigarettes 2.8 kg and instant noodle seasonings 2.5 kg. Outside of the above five products or 26 other types of products weigh less than < 2 kg.

Table 1. Six Types of Products That Contribute the Largest Plastic Waste in Fishing Vessels

Rank	Category	Product Type	Waste generation (kg)	
			< 30 GT	> 30 GT
I	Drink	Mineral water	8.2	11.4
II	Drink	Refreshments	3.4	5.1
III	Food	Instant noodles	1.8	2.5
IV	Food	Soy sauce jerry cans / sauces / oils	0.7	2.0
V	Personal equipment	Cigarette	1.3	1.4
VI	Food	Instant noodle seasoning	1.1	1.4

Large vessels produce more than large vessels, which is motivated by the number of crew members and the duration of the trip. The greater the number of crew members and the longer the fishing period, the more supplies that need to be carried. The number of supplies carried by fishing vessels, however, is not allowed to be too excessive because it will require a large budget. Therefore, rationing is carried out. Rationing supplies at PPP Tegalsari is considered before departure and during the operational life of the vessel as a form of anticipation of a shortage of supplies until the end of the fishing operational trip. In order to ensure that food consumption meets the needs of fishermen, cooks divide food supplies into specific portions for daily consumption. To save on the consumption of beverages and personal equipment, the agent prepares products in small forms such as glass sachets and bottles to save the use of limited resources on board. However, if the supplies brought cannot meet the needs of fishermen until the end of the trip, then generally the captain communicates with other vessel captains so that the requested products are provided and will be replaced when returning to the port.

The potential for new waste to arise from the demand for a number of supplies from other fishing vessels was not detected in this study due to the uncertainty of product demand and product quantity. In addition, other plastic waste used to package B3 waste such as oil and nylon plastic from the net is also not taken into account. For this reason, the incidence of plastic waste found is still lower than the actual plastic waste generation on fishing vessels. However, the figures obtained are enough to prove that the fisheries sector also has the potential to significantly contribute large amounts of plastic waste in the ocean in WPPNRI and the high seas if there is no handling of waste on fishing vessels during the fishing period.

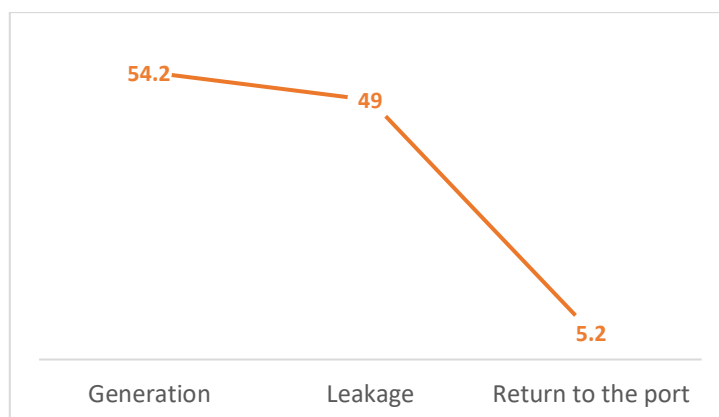
2.3.2 Potential Leakage of Plastic Waste into the Sea

Information regarding the leakage of plastic waste into the sea from fishing vessels was obtained from interviews with the vessel's captain, which has a direct relationship with waste handling.

The estimated leakage of plastic waste in each fishing vessel measuring ≤ 30 GT and > 30 GT is obtained from the division between the weight of waste thrown into the sea and the number of wastes producing units (vessels). An assessment of the leakage of plastic waste into the ocean provides an overview of the contribution of fishing vessels to the entry of pollutants or plastic waste into the ocean in fishing operations.

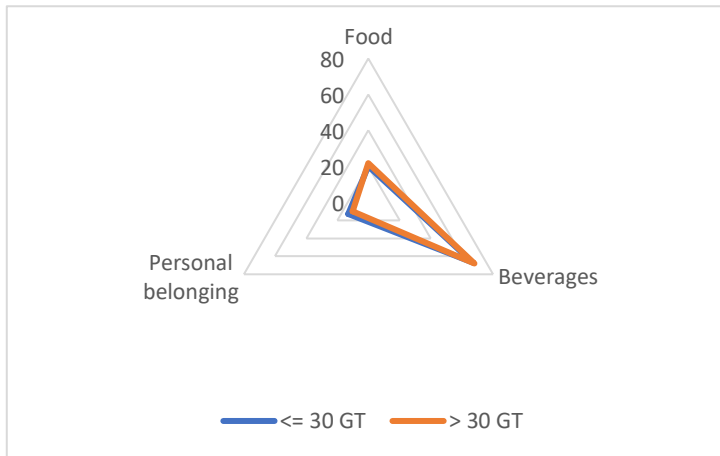
Waste disposed of by fishing vessels measuring ≤ 30 GT and fishing vessels measuring > 30 GT have different weights so to find out the \bar{x} of waste requires separate calculations. The waste generation from fishing vessels ≤ 30 GT would then be reduced by waste leakage, according to the fisherman's statement, divided by 21, while the waste generation of fishing vessels > 30 GT is reduced by waste leakage, according to the fisherman's statement. divided by 83 according to the composition of the respondents. Furthermore, because there is no clear information found related to the amount of waste brought ashore (bags/kg), the calculation is carried out according to the fisherman's statement about the percentage of waste leakage from certain types of packaging.

Of the total 54.2 kg of plastic waste produced on fishing vessels on each trip, 90% is deliberately dumped into the sea and the rest is returned to land for further processing (Chart 2). The entire packaging of flavourings, salt, sugar, soy sauce, flour, tofu, tempeh, oil, coconut milk, tea, milk, toothpaste and medicine pollutes the route passed by the PPP Tegalsari fishing vessel. Toothbrush and jerry can waste are the two types of waste that are least thrown into the sea with percentages of 58.9% and 58.6%, respectively. Waste other than the above types, namely snack packaging, instant noodles, instant seasonings, drinking water, coffee, soft drinks, soap, detergents, shampoos and cigarettes $> 80\%$ is also thrown into the sea during the fishing period of the PPP Tegalsari fishing vessel. The graph below shows the handling status of plastic waste produced on vessels by being thrown into the sea or returned to the port.



Graph 3. Status of Plastic Waste Handling in Fishing Vessels

Looking at the size of the vessel, the fishing vessel > 30 GT contributed 30 kg or 61.1% of the total leakage of plastic waste into the sea during the fishing period at sea, while the fishing vessels measuring \leq 30 GT contributed 19 kg of plastic waste to the sea, with the highest composition owned by beverage supplies with a percentage of 41.4% and 26.6%, respectively. Fishermen's personal equipment supplies contribute the lowest composition of plastic waste leakage into the sea, with the percentage on small vessels at 2.7% and on large vessels at 3%.



Graph 4. Composition of Plastic Waste Leakage into the Sea from Fishing Vessels

On average, PPP Tegalsari fishing vessels conduct fishing operations four times a year. The results of the extrapolation of plastic waste pollution data in a year showed that > 30 GT vessels disposed of 120 kg of waste, while small-sized vessels disposed of 76 kg of waste. A total of 23,075 kg of plastic waste was generated by a total of 958 fishing vessels in 2020, with large vessels accounting for 58% of the total plastic waste leakage.

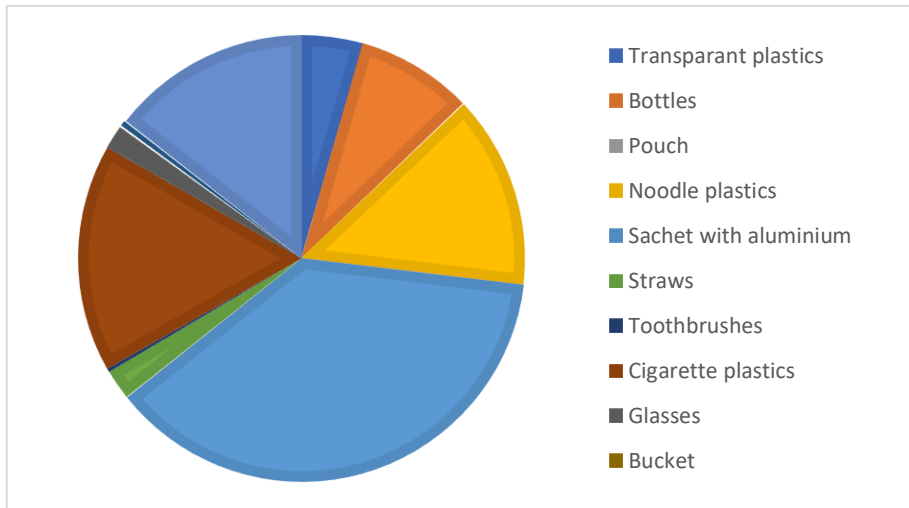
Data from the Ministry of Environment and Forestry in [Katadata \(2020\)](#) states that waste in Indonesia's seas reaches 5.75 tons, with plastic as the main contributor to marine debris, which is 627.8 grams / m². About 70% of the waste comes from land, while the rest is from the sea. TKN-PSL in [the Ministry of Coordination \(2020\)](#) said that 12,784 tons of waste entering the sea came from activities in the sea (not specifying the amount of plastic). This follow-up study emphasizes that although waste coming from the sea only contributes to 30% of the total marine debris, plastic waste dumped into the sea during fishing, for example, has a negative impact on the marine environmental carrying capacity. MECCC is an acceptable threshold for the marine environment without exceeding water quality. This is important to support the management of aquatic pollution ([Liao et al., 2013](#)). The large amount of plastic waste in the ocean has an impact on the limitations of fish acquisition as a result of the death of species from plastic entrapment, interaction and consumption.

The estimated leakage of plastic waste into the ocean is directly related to the amount of waste produced on the vessel. The higher the waste generation on fishing vessels, the higher the amount of waste leaking into the sea. Fishing vessels throw the most mineral water bottles into the sea in terms of weight, which is 16 kg / trip or equivalent to 81.8% of the total mineral water packaging on the vessel because of the high waste generation since the beginning of the waste produced, which is influenced by the density of the product. This is also the same as the generation of waste packaging for soft drinks, instant noodles, cigarettes and instant seasonings as the second to fifth largest contributors of plastic waste to the sea. One thing that is different is that coffee packaging replaces used jerry cans as the biggest pollutant to the sea from Tegalsari PPP fishermen's supplies, which is 2 kg.

Table 2. Six Types of Products That Contribute to Leakage of Plastic Waste into the Ocean

Rank	Category	Product Type	Waste generation (kg)		%
			≤ 30 GT	> 30 GT	
I	Drink	Mineral water	7.8	8.2	81.8
I	Drink	Refreshments	3.1	4.9	93.7
III	Food	Instant noodles	1.6	2.4	92.2
IV	Personal equipment	Cigarette	1.2	1.4	95.1
V	Food	Instant noodle seasoning	0.9	1.4	92.2
VI	Drink	Coffee	0.6	1.3	94.4

The packaging of fishermen's supplies that enter the sea a lot is plastic with aluminium, which is as much as 6,212 packs / trip, which is from snack wrappers, flavourings, soy sauce, chili sauce, instant noodle seasoning, coffee, soft drinks, detergents, shampoos and toothpaste. Cigarette packs then occupy the second position as the largest form of plastic waste polluting the marine environment, namely 2,375 packs / trip (17%). Sachets of instant noodle seasoning and chili sauce/sauce and plastic noodles are the next forms that are most thrown into the sea by fishermen with a total of 2,396 packs/trips and 2317 packs/trips. Drug strips and buckets are the two forms of waste that pollute the marine environment the least from fishing activities in the sea, namely 15 packs/trips and 23 packs/trips. The graph below provides a detailed illustration related to the composition of the shape of plastic packaging that enters the sea from the Tegalsari PPP fishing vessel.



Graph 5. Plastic Marine Debris Packaging

This study provides a detailed overview of the potential for marine-based waste leakage from fishing vessels to capture fishermen's consumption in kilograms, the same as studies from [Kholipah Rahman et al., \(2021\)](#) and [Abdurrahman \(2021\)](#). However, the difference is that this study focuses on plastic waste, while the other two studies explain waste broadly. The study, however, produced more accurate figures that could justify leakage of marine-based marine debris. This is because the weight of waste differs according to the brand of product and the type of packaging (sachets, bottles, glasses, etc.) is included in the determinant of the high and low weight of waste entering the sea. Another difference is that this study discusses the brand of fishermen's supplies that enter the sea, while the two related studies do not. There are other studies that report brands of marine plastic waste in Indonesia, but only 10 brands/companies are known to contribute to marine pollution.

Compared to the initial study of the Quick Assessment Study on Status and Management of Waste at PPP Tegalsari, this follow-up study is more structured explaining the type of plastic waste from fishermen's supplies packaging that enters the sea, and the amount of each package (kg/pcs). Initial studies provide the foundation for the design of questions in the follow-up study questionnaire, from open-ended questions to collecting the widest possible information to closed-ended questions to find out the details of each question.

2.4 Brand Audit of Plastic Waste from Fishermen's Supplies

The brands of fishermen and vessel consumption supplies vary. Some products such as flour, oil, flavourings and chili sauce have the same brand. There are no special rules from vessel agents in choosing the brand of supplies carried. Agents purchase according to product availability at retail subscriptions. vessel agents directly accept products provided by sellers without price consideration if the choice of products is limited. This is also called forced choice decision related

to opportunity costs. The choice included in the forced decision is when the consumer does not have another alternative option, but rather has to choose from the most alternatives, without the opportunity to show that the truly preferred alternative may be the exit option (Penn et al., 2019). The Oxford Dictionary (2010) defines opportunity costs as costs lost as a result of the selection of one alternative. Spiller in the Journal of Consumer Research (2011) states that consumers consider opportunity costs when faced with limited resources, namely time, money or other constraints. In contrast, vessel Agents ignore opportunity costs if they have no limitations (Becker et al., 1974; Friedman et al., 1980; and Langhotz et al., 2002). vessel Agents specifically buy products regardless of the cost burden if a variety of product brands are available. Due to the various factors above, fishermen and vessel consumables supply products have a fairly high variety.

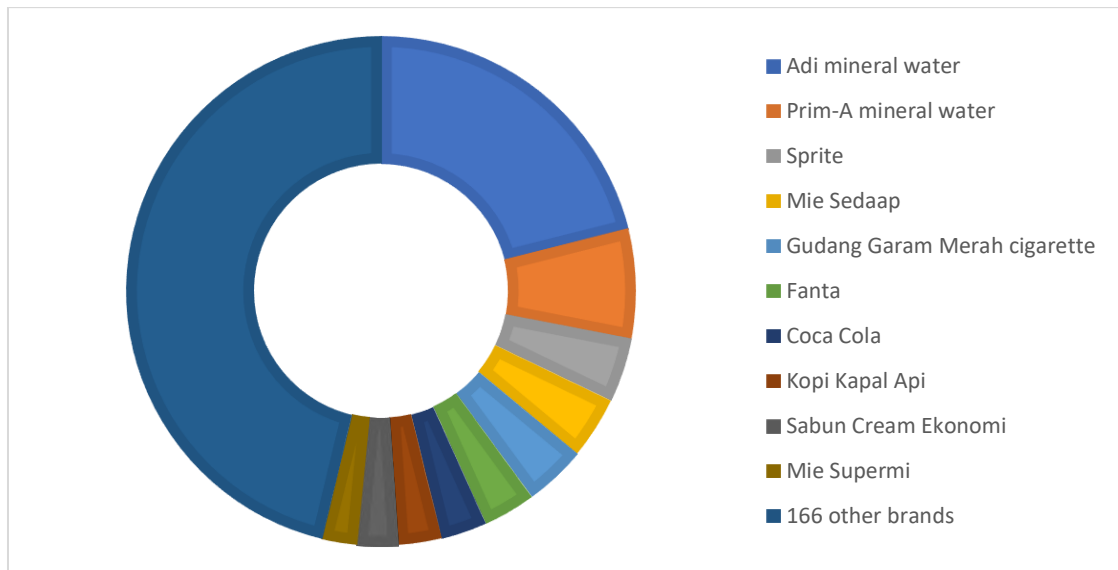
In general, brands that are widely used in fishing operations at sea are products that are familiar to the daily life of fishermen, which are classified as fast-moving consumer goods (FMCG). FMCG has a low price in order to reach a wide target market. FMCG has a low shelf life because related products are easily sold in large quantities on a daily basis.

Approximately 166 product brands from 106 producers used by fishermen on the Tegalsari Fishing Port vessels, of which about 90% of the products are produced by Limited Liability Companies (PT), and the rest are produced by Commanditaire Vennootschap (CV) and Usaha Dagang (UD). There are seven types of fishermen's supplies that do not have a brand or are often called bulk products such as snacks, salt, tempeh, tofu, flour and sugar, soy sauce and sauce / chili sauce. Unbranded products are generally produced on a household scale that pays little attention to labelling. This resulted in information about the manufacturer not being found. All branded and unbranded supplies that were successfully identified in this study can be seen in Appendix II.

2.4.1 The Largest Contributing Brands and Companies to Marine Debris by Weight

Fishermen's supplies of the Tegalsari Fishing Port are produced by local, national and multinational companies. Local products of Tegal City and Slawi City in Central Java Province with the Adi mineral water product brand from PT Tirta Adi Sejahtera and Prim-A mineral water from PT Sinar Sosro contributed the first and second largest plastic waste packaging of total plastic waste entering the sea weighing 10.3 kg / trip (21.1%) and 3.38 kg / trip (7%). Mie Sedaap from Wings Group, Sprite soft drinks, Coca Cola and Fanta from PT Coca Cola Bottling Indonesia, Gudang Garam Merah cigarettes from PT Gudang Garam, Kapal Api coffee from PT Santos Jaya Abadi, Sabun Cream Ekonomi from Wings Group and Supermi noodles from PT

Indofood CBP Sukses Makmur contributed to the entry of 1 - 2 kg of plastic waste into the sea. Unspecified products contribute to the < 0.50 kg of marine plastic waste per vessel per trip. The picture below illustrates the brand and composition of the most fishermen's supplies that enter the sea.



Graph 6. Types of Plastic Marine Debris Packaging

The Brand Footprint Indonesia 2021 report from [Kantar Indonesia](#) shows the trend of using products with different brands from the Brand Audit of Fishermen's Supplies PPP Tegalsari. The order of product categories most widely used by PPP Tegalsari fishermen is mineral water, instant noodles, soft drinks, cigarettes and instant coffee, while the order of products that are widely used by Indonesians according to [Kantar Indonesia \(2021\)](#) is instant noodles, biscuits, instant coffee, detergents and flavourings. Related reports show that Indomie instant noodles are the top choice of consumers, while the results of this study show that Sedaap noodles are the main choice of fishermen. Masako flavourings and Economy soap creams are more widely used in ports compared to Royco flavourings and So Klin detergents. In this study, it was also found that Frisian Flag milk was not in the first position as a dairy product widely consumed at the port, but Indomilk. Roma Kelapa Biscuits and Vegetable Biscuits are not the main food consumption of fishermen, but unbranded kilo snacks. Kapal Api Coffee occupies the sixth position as the product that is most in demand by fishermen compared to other beverage categories, or is not in the first position as the results of a survey from [Kantar Indonesia \(2021\)](#). Table 3 shows a comparison of brand audits of DFW Indonesia and Kantar Indonesia.

Table 3. Comparison of Brand Audit / Footprint Results from DFW Indonesia and Kantar Indonesia

Product Category	Rank	Brand Audit by DFW Indonesia	Brand Footprint by Kantar Indonesia
Food	1	Mie Sedaap	Indomie
	2	Masako	Mie Sedaap
	3	Supermi	Royco
	4	Royco	Rome
	5	Gulaku	Masako
Drink	1	Adi mineral water	Kapal Api
	2	Prim-A mineral water	Good Day
	3	Sprites	Mongoose
	4	Coca Cola	Top Coffee
	5	Fanta	Aqua
Dairy Products	1	Indomilk	Frisian
	2	Frisian	Indomilk
	3	Enaaak	Dancow
	4	Bear Brand	Aice
	5	Omela	Bear Brand
Personal Care	1	Pepsodent	Lifebuoy
	2	Formula	Pepsodent
	3	Clear	Giv
	4	Ciptadent	Nuvo
	5	Pantene	Pantene
Home Care	1	Economy Cream	So Klin
	2	Daia	Sunlight
	3	Rinso	Daia
	4	So Klin	Downy
	5	Wings	Rinso

Source: [Kantar Indonesia \(2021\)](#)

The brand differences between the two studies were motivated by (1) the need for low-priced products so that they could obtain goods in sufficient quantities for marine life and (2) the effectiveness of the products in extreme conditions. Products that occupy the first position for the DFW Indonesia brand audit study have affordable prices and can encourage the purchase of other needs. Related products are claimed to have the same and even better functions. Economic Cream Soap, for example, is preferred to be taken to sea compared to detergent soap or bath soap because of its foaming nature when in contact with seawater that has high salinity. Fishermen have difficulty cleaning the body, tableware and clothes only by relying on detergent soap and bath soap because it is difficult to foam.

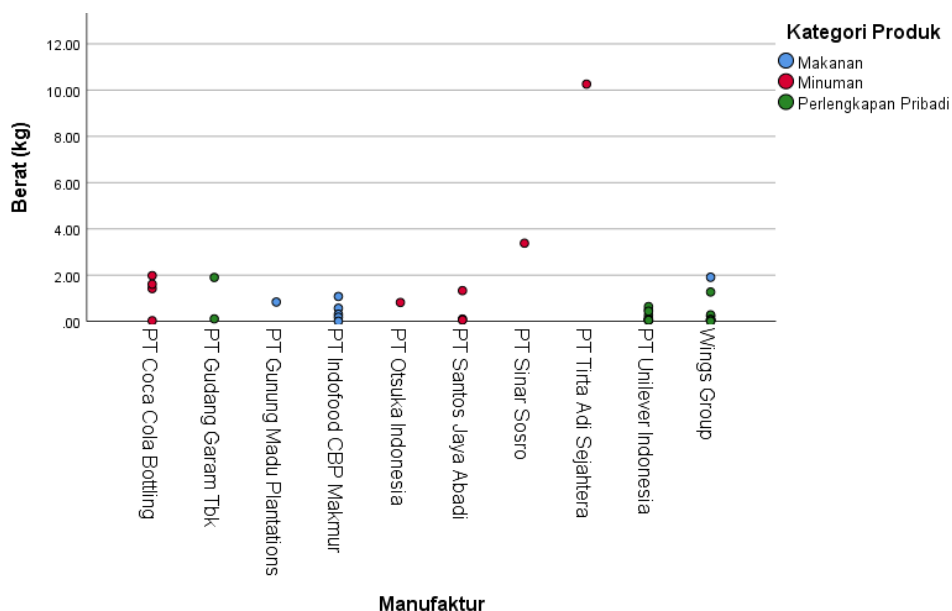
PT Tirta Adi Sejahtera, PT Coca Cola Bottling Indonesia, Wings Group, PT Sinar Sosro, PT Unilever Indonesia, PT Gudang Garam, PT Indofood CBP Sukses Makmur, PT Santos Jaya Abadi, PT Gunung Madu Plantations and PT Otsuka Indonesia are the ten largest contributors of

marine plastic waste from the capture fisheries sector of Tegalsari Fishing Port based on the weight of the waste.



Figure 2. 10 Largest Contributors of Marine Plastic Waste Based on Weight

Although only from one product, PT Tirta Adi Sejahtera is a major contributor to marine pollutants, while nine other large companies account for less than 4 kg or 8%. Wings Group with three subsidiaries, namely PT Sayap Mas Utama, PT Lion Wings, and PT Wings Surya has nine product brands that enter the sea, but is in third place (3.97 kg / trip), below PT Tirta Adi Sejahtera and PT Coca Cola Bottling Indonesia with four products (5.04 kg / trip). PT Unilever Indonesia also has the same number of products as Wings Group, but occupies the fifth position with a weight of 2.23 kg / trip, just below PT Sinar Sosro with one product weighing 3.38 kg / trip. PT Indofood CBP Sukses Makmur occupies the seventh position of the largest contributor of waste in the operating period of the Tegalsari PPP capture fishing vessel with a product weight of 2.15 kg / trip, after PT Gudang Garam Indonesia with two products, namely 2.01 kg / trip. PT Santos Jaya Abadi with three products contributed to 1.49 kg of plastic waste/trip, PT Gunung Madu Plantations 0.63 kg/trip and PT Otsuka Indonesia 0.54 kg/trip with one product each.



Graph 7. Weight of Plastic Marine Debris Based on Manufactures

Graph 7 shows that five out of ten manufacturers donate plastic waste of beverage packaging to the ocean, each of which two companies put food packaging and personal supplies into the ocean and one company donates food packaging, beverages and personal supplies to the ocean. PT Coca Cola Bottling and PT Otsuka Indonesia contributed to the waste of soft drink bottles, PT Santos Jaya Abadi to sachets and coffee wraps, PT Tirta Adi Sejahtera and PT Sinar Sosro to bottles and glasses of mineral water. PT Gunung Madu Plantations and PT Indofood CBP Sukses Makmur produce marine plastic waste from food packaging, namely sugar wrap, instant noodles, wheat and soy sauce. PT Unilever Indonesia produces waste from food packaging and personal supplies from flavouring wraps, soy sauce, soap, shampoo, toothbrushes, toothpaste, and detergents. Wings Group produces waste from food packaging, beverages and fishermen's personal equipment such as instant noodle wrappers, cream soap, soy sauce, soft drinks, detergents, toothpaste, soap, and shampoos.

Comparing the results of this brand audit with the results of other brand audits is difficult to do. No brand audit was found that calculated the weight of plastic waste in kg units based on brand and/or manufacturing. The report "Branded: In Search of the World's Top Corporate Plastic Polluters Volume 1" ([Greenpeace USA, 2018](#)) does not specify the weight of waste by brand or manufacturing of clean-up activities at five points in Indonesia in 2018, but rather describes the amount of waste. Related reports mentioned total waste in weight at one of the monitoring sites, but not in Indonesia. Reports in Indonesia do not mention the amount of plastic waste found in the ocean and its constituent composition. The "Branded Volume IV" report in 2020 also only mentions the presence of plastic waste from PT Unilever Indonesia's personal care products, without explaining the amount.

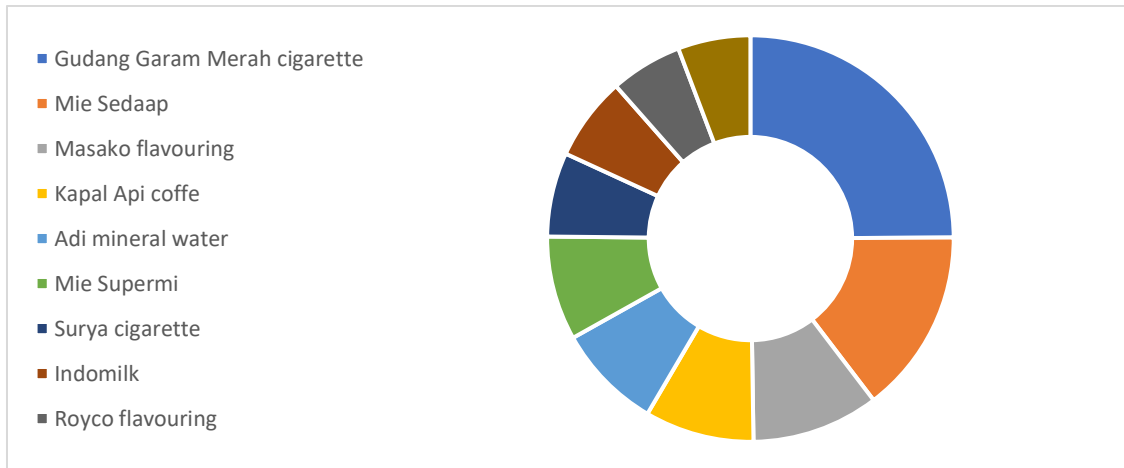
The brand audit carried out by DFW Indonesia uses a different data collection method from the Brand Audit carried out by other organizations using the clean-up method. DFW Indonesia identifies marine debris leaks directly from major actors/polluters upstream before the waste is generated compared to when the waste has polluted the marine environment. The goal is to obtain detailed information about all consumption packaging that is thrown into the sea during fishing operations. This method is believed to be more able to help develop a more targeted and structured database to encourage the implementation of [the P.75/MENLHK/SETJEN/KUM.1/10/2019](#) policy. Upstream assessments can also help answer questions regarding sources/activities that incorporate certain brands of plastic into the ocean. Although the backward and forward trajectory modelling method can determine the origin of marine debris, the analysis from the source has better validation and reliability. The method

applied by DFW Indonesia, although more time-consuming and involves more parties, provides comprehensive data and information related to the problem under study.

2.4.2 The Largest Contributing Brands and Companies to Marine Debris by Quantity

The top ten product brands that contribute to the entry of plastic waste into the sea are occupied by Gudang Garam Merah Cigarettes, Sedaap Noodles, Masako Flavouring, Kapal Api Coffee, Adi Mineral Water, Supermi Noodles, Solar Cigarettes, Indomilk, Royco Flavouring and Frisian Flag Milk. Cigarettes from PT Gudang Garam produce the most plastic waste into the sea which reaches 1,905 packs / trip. The quantity is far above other products which range from less than 1,200 packs/trip. A total of 1,125 packs of Sedaap noodles were found polluting the ocean from each vessel per trip. Kapal Api Coffee to Supermi Noodles contributed more than 600 plastic wraps to the sea. Each PPP Tegalsari fishing vessel puts as many as 512 packs of Surya cigarettes and 508 sachets of Indomilk into the sea in one trip. Royco Flavouring and Frisian Flag Milk are ranked ninth and tenth as the largest contributors of plastic waste to the ocean with 438 packs/trips and 441 packs/trips.

Five of the plastic wastes brands that contribute to marine debris by weight also have a high quantity of products such as Gudang Garam Merah Cigarettes, Mie Sedaap, Kapal Api Coffee, Supermi Noodles and Adi Mineral Water. However, the weight of the product is known to have no significant relationship with the quantity of the product. In other words, products that have a large weight do not always have a high quantity and vice versa. These conditions are shown in Chart 7. Adi mineral water that contributes to the largest marine debris in terms of weight occupies the fifth position in terms of quantity. Gudang Garam cigarettes are in sixth place in terms of weight, but have the highest quantity of products. Supermi noodle packaging occupies the fifth position among by quantity, but occupies the last position in terms of weight because it has a low density. Mie Sedaap is not in a much different position both in terms of quantity and weight.



Graph 8. Quantity of Plastic Marine Debris Based on Brand

Comparing the above results with the results of the Kantar Indonesia study (2021), Kapal Api Coffee both occupy the first position as the most preferred drink by consumers. However, for other products, there is no match. The five FMCG categories that are widely consumed by fishermen in ports based on quantity include cigarettes, instant noodles, flavourings, coffee and mineral water. Three of these categories are the same as Kantar Indonesia's report (2021) but the product brands chosen by their respective audiences have different ratings. Masako Flavouring and Sedaap Instant Noodles are still more popular with fishermen compared to Royco Flavouring and Indomie Instant Noodles as reported by Kantar Indonesia.

Seven of the ten largest contributors to plastic packaging weight also contribute to the entry of high quantities of plastic waste into the ocean, including PT Gudang Garam, Wings Group, PT Indofood CBP Sukses Makmur, PT Unilever Indonesia, PT Santos Jaya Abadi, PT Tirta Adi Sejahtera and PT Sinar Sosro. Three other companies that have a significant amount of waste in the sea are produced from PT Ajinomoto Indonesia, PT Indolacto, and PT Frisian Flag Indonesia.



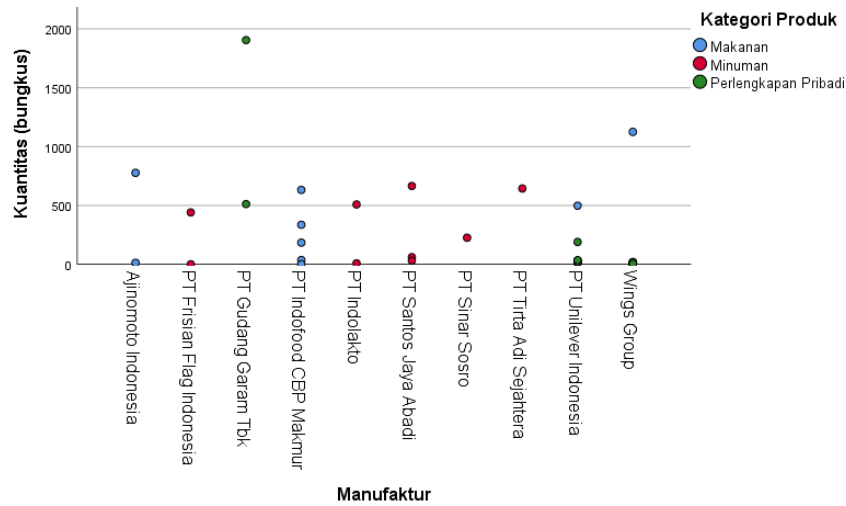
Figure 3. 10 Largest Contributors of Marine Plastic Waste Based on Quantity

Gudang Garam Merah cigarettes and Surya cigarettes from PT Gudang Garam contributed to the entry of the largest plastic packaging into the sea from fishing vessels, namely 2,417 packs/trip. Wings Group then PT Indofood CBP Sukses Makmur followed right below it with the amount of plastic thrown into the sea around 1200 packs / trip. PT Sayap Mas Utama

produces the most waste from Wings Group manufacturing in the form of Packaging Mie Sedaap, Kecap Sedaap, Isoplus soft drinks, Economy soap cream, and Daia detergent, while PT Indofood CBP Sukses Makmur produces marine debris from plastic packaging of Mie Supermi, Mie Sarimi, Indomie, Blue Triangle Flour and Indofood Soy Sauce. Product packaging from PT Unilever Indonesia, PT Ajinomoto Indonesia and PT Santos Jaya Abadi occupy the fourth to sixth positions contributing marine plastic packaging from TEGALSARI PPP fishermen's supplies with a total of 875 packs/trip, 790 packs/trip and 757 packs/trip.

Products from PT Unilever that were found dumped into the sea in the fishing activities of the PPP Tegalsari fishing vessel include Toothpaste and Toothbrushes Pepsodent, Royco, Lifebuoy soaps and shampoos, Bango soy sauce, Rinso detergent and Clear shampoo and Sunsilk. Plastic packaging of Masako and Ajinomoto Flavouring from PT Ajinomoto Indonesia and plastic packaging of Kapal Api Coffee, ABC Coffee and Good Day from PT Santos Jaya Abadi are brands of waste found entering the sea on the vesseling and fishing routes of the PPP Tegalsari fishing vessel. Furthermore, PT Indolakto contributed 127 fewer plastic packets to the sea than PT Tirta Adi Sejahtera, but 75 more packs than PT Frisian Flag. PT Indolakto and PT Frisian Flag Indonesia each produce beverage waste from milk packaging. The product packaging from PT Sinar Sosro that entered the sea was a total of 226 bottles and glasses /trips from one product brand, such as PT Tirta Adi Sejahtera.

Although only of the two products, PT Gudang Garam beat Wings Group, PT Unilever Indonesia and PT Indofood CBP Sukses Makmur, with more than five types of products, as the main contributors to marine plastic waste from the Tegalsari fishing vessels. This is motivated by the high need for cigarettes during the fishing period of fishermen every day. Cigarettes are claimed to be the primary need of fishermen that cannot be delayed compared to other needs, which are consumed at least one pack per day per person. Although food and drinks are also consumed daily, the frequency of fishermen to smoke is higher, especially in waiting time for net lifting, relaxing/ chatting, driving, repairing / emulsifying vessel engines and others. In addition, other consumables such as soap, shampoo, detergent are claimed not to be used every day, but rather once every three days or once a week. The two things above then make the amount of waste from food, beverage and body care supplies lower than cigarettes / This results in plastic waste entering the sea from the three categories of supplies is lower than plastic packaging from cigarettes mainly in terms of quantity.



Graph 9. Quantity of Plastic Marine Debris Based on Manufactures

PT Indolakto, PT Frisian Flag and PT Ajinomoto Indonesia are the three manufacturers that are not included in the largest plastic waste contributors based on the weight of waste, but are among the ten largest plastic waste contributor companies based on product quantity. On the other hand, PT Coca Cola Bottling Indonesia, PT Gunung Madu Plantations and PT Otsuka Indonesia have a smaller number of products, but because they have a high density of products contribute to the weight of waste entering the sea.

There are differences in manufacturing and the amount of plastic waste between the 2018 brand audit and this brand audit. The Branded 2018 report from [Greenpeace USA \(2018\)](#) shows that PT Danone Indonesia, PT Indofood CBP Sukses Makmur, PT Unilever Indonesia, Tudung Group, PT Procter & Gamble (P&G), PT Coca Cola Bottling Indonesia, PT Mayora Indah, PT Heinz ABC Indonesia, PT Pepsi Indobeverages and Nestlé are the ten largest contributors of plastic waste to the ocean. Except for PT Unilever Indonesia, PT Indofood CBP Sukses Makmur and Mayora Indah, other companies donate a smaller amount of plastic waste in the ocean. PT P&G contributed a total of 23 plastic bottles of Mizone and Aqua and 94 sachets of Pantene and Head & Shoulders shampoos to the sea from one vessel on each trip, while Nestlé Indonesia with Bear Brand products included 14 packs of plastic waste/ trip. Products from Tudung Group, Kraft Heinz and Pepsi were not used by fishermen during the fishing period so no plastic waste from the company was found dumped into the sea.

Table 4. Differences in Results between DFW Indonesia Brand Audit 2022 and Brand Audit 2018

Rank	Brand Audit DFW Indonesia		Brand Audit Reference 2018	
	Manufacturing	Σ (wrap/trip)	Manufacturing	Sum (wrap)
1	PT Gudang Garam	2.417	PT Danone Indonesia	563
2	PT Indofood CBP Sukses Makmur	1.208	PT Indofood CBP Sukses Makmur	384
3	Wings Group	1.206	PT Unilever Indonesia	335
4	PT Unilever Indonesia	855	Hood Group	106
5	PT Santos Jaya Abadi	808	PT P&G	105
6	PT Ajinomoto Indonesia	790	PT Coca Cola Bottling Indonesia,	98
7	PT Tirta Adi Sejahtera	664	PT Mayora Indah	94
8	PT Indolacto	517	PT Heinz ABC Indonesia	52
9	PT Frisian Flag Indonesia	441	PT Pepsi Indobeverages	40
10	PT Coca Cola Bottling Indonesia	237	Nestlé Australia	19

Source: [Greenpeace USA \(2018\)](#)

Brands, numbers and manufacturing ratings of marine plastic waste contributors varied in both studies as a result of data collection techniques and locations, as well as different target audiences. Brand audits carried out at ports collect comprehensive information about all brands, manufactures and quantities of plastic waste that have the potential to enter the sea from fishermen's supplies within a trip duration of 20 to > 90 days with a crew of 14 people to 40 people, while brand audits carried out in coastal areas in Indonesia collect information partially from waste carried away from unknown sources of waste. Related studies cannot see the broader side that one company can contribute more than 10 products if it does not find product variations in one manufacturer. The brand audit at the port also has the limitation that it can only identify less than 30% of the FMCG brand which is 166

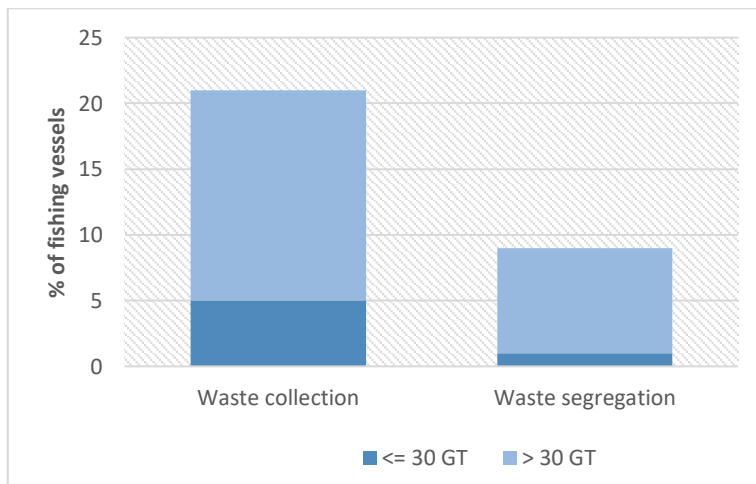
2.5 Waste Management in Capture Fishing Vessels

Waste management must be carried out in a structured and sustainable manner as a form of preventing the entry of waste into the environment so that it does not exceed the environmental quality standards that have been set under [Law No. 32/2009](#). Waste management is a systematic, holistic, continuous activity that includes waste reduction and handling ([Law No. 18/2008](#)). Waste reduction in fishing vessels includes efforts to reuse goods that can still be used for both the same and different functions, while waste handling on fishing vessels includes efforts to re-arrange, sort and collect waste back to the port. These three efforts are important for the crew of the fishing vessel starting from the vessel leaving the port until the vessel returns to the port.

Efforts to reuse waste are carried out by a small number of fishing vessels at the Tegalsari Fishing Port with a composition of only < 30%. Waste that is commonly reused is cardboard waste and bags of rice / wheat / sugar, which are used as floor mats for vessels during fishing periods. Part of the used oil is claimed to be also reused to emulsify vessel engines. Other types of waste such as bottles and drinking cups, buckets of cream soap and many other types of plastic waste do not get reuse intervention, which has implications for the entry of most pollutants from Tegalsari fishing vessels into the Fisheries Management Area of Indonesia (WPPNRI) and the high seas.

Apart from the limited implementation of waste reduction, the lack of waste handling on vessels also contributes to an increase in the amount of plastic waste in Indonesia's seas. The results of this study show that PPP Tegalsari capture fishing industry players are more focused on fulfilling economic aspects and excluding environmental aspects in the fishing period or in other words fishermen do not pay more attention to other things beyond achieving economic benefits / values, including the importance of providing facilities to support the management of waste handling on vessels. Almost all vessel agents do not put trash cans on the shopping list because they are not ordered by the captain. This has implications for the absence of pockets on all PPP Tegalsari fishing vessels. The relevant party replied that fish plastic and sacks are usually used to replace the function of waste storage so that the purchase of separate places/waste bags is not needed. Responding to this, DFW Indonesia saw that fishing vessel crews had a more significant disadvantage by using fish plastic to accommodate waste. This is because the price of fish plastic is more expensive and excessive use can cause a long shortage of commodities in the sea to accommodate fish packaging needs. Sacks are one of the right options in minimizing the use of plastic on vessels, so DFW Indonesia supports the program to be able to run on a larger number of vessels in the future.

The use case of fish plastic and sacks, although it is so rarely found (20.2%) because generally PPP Tegalsari fishing vessels do not have waste disposal facilities. The absence of trash cans resulted in the non-implementation of efforts to collect and sort waste on vessels. Less than 1/4 of the ≤ 30 GT vessels had waste storage and only 4.8% held disaggregated bins. Vessels of $>$ size 30 GT have more significant problems than the size of vessels ≤ 30 GT. Only about 14.5% of these larger-sized fishing vessels had storage for waste and only 4.4% of vessels used disaggregated bins.



Graph 10. Waste Collection and Sorting on PPP Tegalsari Fishing Vessels

The > 30 GT vessel has two to more than five bins, while the ≤ 30 GT vessel uses one to more than five bins. Trash cans on large vessels are mostly on the deck of the vessel (13.2%), while the trash cans on small vessels are on the deck and stern of the vessel (3.8%). Each of the vessels of a different class also has a trash can in the vessel's platform area.

The absence of supporting facilities is one of the reasons why fishermen do not collect and sort waste during the sailing and fishing period (21.2%). The lack of trash cans and disaggregated bins on vessels is claimed to make the crews of fishing vessels have no motivation to collect and separate the waste on board. On the other hand, there were also fishermen who stated that they did not carry out the destruction and sorting of waste on the vessel because they did not want to participate (20.2%). Fishing conditions on wooden motor vessels, which are heavily influenced by natural factors, are believed to require more of a main focus on the captain and fishing crews so that the implementation of handling waste is claimed to be difficult. The statement is not entirely true because the removal and sorting of waste does not take a long time to be implemented. Fishermen do not need to continue to supervise the implementation of waste handling, but only need to ensure that (1) disaggregated officers and bins are available; (2) the exact location of the container; (3) the removal of the full container; and (4) replacement

of bins. Another reason or the main reason AWK does not handle waste on vessels is for impractical reasons (31.7%). Related parties prefer to throw waste directly into the sea instead of storing waste on vessels because it is easier to do. It is feared that long-term waste storage will have a negative impact on fishing activities carried out for months at sea. Apart from these three reasons, seven other reasons stated by fishermen as the cause of the non-occurrence of waste harvesting and sorting on vessels are due to (1) being lazy 11.5%; (2) no time 3.8%; (3) assumptions that waste is easily washed away in the sea, (4) waste is directly burned, (5) difficult to discipline crew members, (6) there are no special officers 1.9%; (7) and increase employment by 1%.

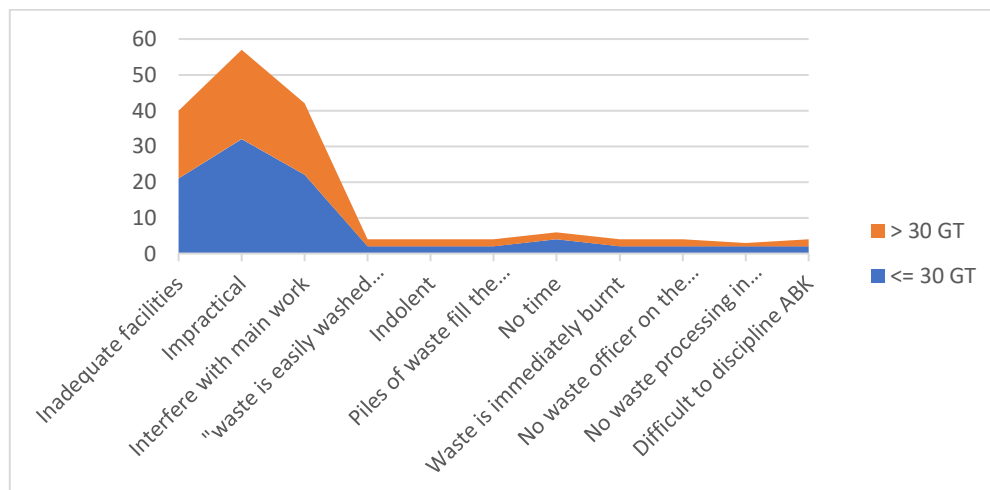


Chart 10. Factors Inhibiting the Implementation of Waste Sorting and Sorting in PPP Tegalsari1

Waste collection is a continuity of the two stages of waste handling in the fishing vessels above. Waste collection on fishing vessels has a slightly different meaning compared to the definition stipulated in [Law No. 18/2008](#) that waste collection is the collection and transfer of waste from the source to temporary shelters or integrated waste processing sites, but rather the collection and transfer of waste from vessels to ports. The cleaners or waste management groups will then take the waste to the TPS or TPST. This step is carried out to encourage the recording of the amount and type of waste returned by fishermen.

Waste collection is still not carried out effectively on the PPP Tegalsari fishing vessel as a result of the non-optimal implementation of waste storage and sorting at the port. The results of the data analysis showed that only 11.6% or 6.4 kg of plastic waste was returned for further handling/processing at the port. Jerry cans and used toothbrushes are the two types of waste that are most brought back to the Tegalsari Beach Fishing Port with a percentage of 41.4%. The number of mineral water bottles returned to land (16 kg/trip) is more than double the number of instant noodle soap and seasoning packaging, four times the number of soft drink packaging

and six times the number of coffee packaging. A total of three kg packs of instant noodles along with flavourings returned to the port from each vessel at the end of the trip. A total of one kg pack of cigarettes, detergents and snacks and 0.24 kg of shampoo packaging are returned by each fishing vessel every time they complete the fishing operation. In contrast to these packaging, the plastic packaging of flavourings, salt, sugar, soy sauce, sauce, flour, tofu, tempeh, oil, coconut milk powder, milk, tea, toothpaste and medicine is not returned to land or in other words all the waste is thrown into the sea by fishermen during the sailing and fishing period at WPPNRI.

The return of waste is motivated by two things, namely (1) the potential economic value/use/recycling and (2) the location and time of leaning the vessel. Jerry cans, toothbrushes and sacks were returned to land because they were claimed to be still usable after the end of the sea fishing operation. Some of the fishing industry players know that jerry cans and sacks have economic value and can be recycled because they have their own collectors. This then encourages the captain/ABK to return the related type of waste. Furthermore, because it is considered that it still has daily use value after the fishing operation is completed, the toothbrushes are quite a lot returned to land. A small percentage of fishermen return bottled bottles of mineral water and soft drinks because of the good awareness that plastic bottles can have recycled value. In contrast, most fishermen bring back packaging of soaps, soft drinks, detergents, shampoos, instant packs and condiments, cigarettes and snacks due to the location that has approached the dock and the limited time to throw waste into the sea before the vessel leans.

2.6 Implementation of Waste Reduction Map by Producer

[Permen LHK No.P.75/MENLHK/SETJEN/KUM.1/10/2019](#) is a reference for waste reduction for producers for the period 2020 – 2029. Article 2 (2) stipulates that the target map of waste reduction is 30% compared to the amount of waste generation in the final period of the program. Related producers include business actors and / or activities in the fields of manufacturing, food and beverage services and retail. Manufacturers in manufacturing are a major focus because the marine plastic debris identified in this study is produced with tools, equipment, production machinery and labour on a large scale. The manufacturing sector covers three main domains, namely the food industry, the consumer goods and the cosmetics and body care industries.

Related regulations establish manufacturing obligations in reducing waste through restriction, recycling and reuse of waste, including plastic waste. Waste reduction is carried out on products,

product packaging and/or containers that are difficult to decompose by natural processes, cannot be recycled and cannot be reused. Efforts to limit waste (R1) include the use of embossed printing technology as a substitute for plastic labels and ink printing on PE type plastic bottles (HDPE and LDPE) and PET and prohibiting the use of PVC, PP and PS products, packaging, and/or containers starting from January 1, 2030 (R2). The recycling of the three plastics must be carried out until the effectiveness of the implementation of the ban on single-use products. PE, PVC, PP and PS plastics must also be reduced by being reused. Recycling plastic waste from manufacturing includes:

1. Use of 100% recycled materials;
2. Use of 50% recycled content material recycled other packaging
3. Close loop or recycled into the same packaging
4. Open loop or recycled into raw materials for finished/ downstream products

The table below shows the commitment and achievements of the 13 companies that contribute the largest plastic waste to the sea in terms of weight and quantity of waste related to [the Minister of Environment and Forestry Regulation No. P.75/MENLHK/SETJEN/KUM.1/10/2019](#).

Multinational companies such as Coca Cola Bottling, Unilever, Otsuka, Ajinomoto and Frisian Flag have a clear commitment to reducing plastic waste. Only one company, PT Indofood CBP Sukses Makmur, has a real commitment to support the reduction of plastic waste both in the pre-consumption and post-consumption stages. This difference is driven by the global target of reducing plastic as a raw material and post-consumption plastic waste for multinational companies, while for national companies, the target of reducing plastic waste is still not considered. Local companies have more difficult conditions, with very rare manufacturers paying attention to reducing single-use plastics or recyclable and reusable waste.

Table 5. Commitment and Achievement of Waste Reduction Roadmap

No.	Manufacturing	Commitment	Achievement
1	PT Tirta Adi Sejahtera	Not found	Not found
2	PT Coca Cola Bottling Indonesia	<ol style="list-style-type: none"> 1. Collect and recycle every bottle sold globally by 2030 2. Ensuring 100% of the packaging is recyclable by 2025 3. Using at least 50% recycled materials in its packaging by 2030 4. Reducing the use of virgin plastics derived from non-renewable sources by 3 million cumulative metric tons by 2025 	<p>Through the Recycle Me Initiative</p> <ol style="list-style-type: none"> 1. Replacement of coloured bottles to transparent PET 2. Bottle packaging designed for recycling 3. Application of Affordable Small Sparkling Package (ASSP) technology 4. Improved waste collection and recycling infrastructure
3	Wings Group	The use of biodegradable plastics	Not found
4	PT Unilever Indonesia	<p>2045 targets</p> <ol style="list-style-type: none"> 1. Halve the use of virgin plastic or new plastics, by reducing the use of plastic packaging by more than 100,000 tons and accelerating the use of recycled plastics 2. Ensure 100% of its plastic packaging is reusable, recyclable, or compostable 3. Collecting and processing more plastic than is sold 4. Increase the use of recycled plastic content (PCR) in its packaging, by at least 25% 	<ol style="list-style-type: none"> 1. Collecting and processing more than 45,900 tons of plastic waste in 2021 through the collection of plastic waste from a network of waste banks of more than 24,500 tons 2. Waste processing through RDF technology as much as more than 21,400 tons
5	PT Sinar Sosro	Not found	Not found
6	PT Indofood CBP Sukses Makmur	<p>Applying economic principles circular in the organisation value chain, as well as actively managing post-consumption waste through work same with the community, major industry players and the Government to help improve the</p>	<ol style="list-style-type: none"> 1. Application of environmentally friendly packaging technology and recycling through the Packaging and Recycling Association for Indonesia Sustainable Environment (PRAISE) 2. Use of more efficient materials for plastic beverage bottle packaging that is 30%

		ecosystem and waste management infrastructure throughout Indonesia	lighter and reduction in beverage bottle packaging thickness 3. 76% of post-production plastic waste (more than 9,000 tons) is managed in collaboration with waste collectors through the Waste Bank, Green Warmindo to be sent to the recycling industry and the rest (more than 2,800 tons) recycled internally in the Flexible Packaging Division 4. Building a circular economy ecosystem model for polyethylene terephthalate ("PET") plastics, with expansion targets to include used beverage cartons ("UBC"), high-density polyethylene ("HDPE"), and flexible plastics
7	PT Gudang Garam	Not found	Not found
8	PT Santos Jaya Abadi	Not found	Not found
9	PT GMP	Not found	Not found
10	PT Otsuka Indonesia	1. Using PET bottles from recycled materials and plant-based materials and increasing the percentage of sustainable resource use in the production process globally by 100 percent by 2030 2. Using 100% recycled raw materials and plant-derived raw materials by 2050	Not found
11	PT Ajinomoto Indonesia	Adhering to Ajinomoto Shared Value (ASV) as a contribution to plastic waste management and other environmental impacts	Ajinomoto's paper packaging modification reduced the use of plastic by 30%, Masako by 8.4% and Sajiku by 9.5%.
12	PT Indolakto	Not found	Not found
13	PT Frisian Flag Indonesia	1. Using 100% recyclable packaging by 2025 2. Reduction of plastic waste 10 tons / year	1. The use of paper straws, with food grade certified, gluten-free allergen and FSG certified 2. Straw sticks with the main packaging of the product

Judging from the achievement of the targets of multinational companies above, only Unilever and Ajinomoto provide statistical information. PT Unilever Indonesia claims to have succeeded in collecting and processing more than 45,900 tons of plastic waste in 2021 through the collection of plastic waste from a waste bank network of more than 24,500 tons and successfully processed more than 21,400 tons of waste through RDF technology (Sayekti, 2022). PT Ajinomoto Indonesia then succeeded in modifying plastic packaging with paper so as to reduce the use of plastic by up to 30% for Ajinomoto products, 8.4% for Masako and 9.5% for Sajiku (Ajinomoto, 2022). Coca Cola Bottling Indonesia stated that it replaced coloured bottles to transparent PET (has high economic value), designed recycled bottles, implemented Affordable Small Sparkling Package (ASSP) technology and succeeded in improving waste collection and recycling infrastructure (Coca Cola Amatil Indonesia, 2021). PT Frisian Flag Indonesia claims to have succeeded in reducing the use of plastic by replacing it with paper straws, where straws are made to stick to the main packaging of the product in order to reduce the amount of waste that enters the landfill (Rindrawati, 2021). Unlike the four related multinational companies, PT Otsuka Indonesia did not provide updates regarding the achievement of plastic waste reduction targets at the national level both statistically and non-statistically.

National companies such as Indofood do not explain statistically about the commitment to reduce plastic waste that they want to carry out, but provide detailed information on the achievements of plastic waste reduction that have been successfully carried out. PT Indofood CBP Sukses Makmur Indonesia claims to use more efficient materials for plastic beverage bottle packaging which is 30% lighter and has succeeded in reducing the thickness of beverage bottle packaging. Related companies have also succeeded in reducing 76% of post-production plastic waste (more than 9,000 tons), collaborating with waste collectors through the Waste Bank, Green Warmindo to be sent to the recycling industry and the rest (more than 2,800 tons) recycled internally in the Flexible Packaging Division (Indofood, 2021). Other large companies such as Wings Group and Gudang Garam do not have a clear commitment in supporting waste reduction by producers, as can be seen from the absence of related information found on the website or in other sources from literature studies conducted. This is also the same as other national companies such as GMP, Santos Jaya Abadi and Indolakto as well as a local Tegal company, namely Tirta Adi Sejahtera, which was not found to contribute to the [Minister of Environment and Forestry Regulation No. 75/2019](#).

3 Conclusions and Recommendations

3.1 Conclusions

1. **Plastic waste generation.** A total of 54.2 kg of plastic waste is produced by each PPP Tegalsari fishing vessel in one fishing trip. Vessels measuring > 30 GT produces a total of 31.7 kg of plastic waste or equivalent to 59.2% of the total plastic waste on the vessel, with the largest composition of plastic waste donated from beverage supplies (26.6%), and the smallest composition of fishermen's personal equipment (40%).
2. **Estimation of plastic waste leakage into the sea.** About 90% of the plastic waste generated in fishing vessels is dumped into the sea by fishermen to WPPNRI. Fishing vessels measuring > 30 GT accounted for 60.1% of the total leakage of plastic waste into the sea, with beverage packaging as the main contributor to marine plastic waste (26.2%) and fishermen's personal equipment packaging as the lowest contributor (41.4%). Food packaging sits between beverage packaging waste and fishermen's personal equipment packaging waste. The estimate does not include fishing equipment (API) and fishing aids (ABPI) due to limited information from the vessel's captain.
3. **Brand audit.** In terms of weight, Adi mineral water bottles and cups from a local producer, PT Tirta Adi Sejahtera, contributed the largest plastic waste to the sea from fishermen's supplies, which was 10.3 kg / trip. Prim-A mineral water from PT Sinar Sosro occupies the second position as the largest marine plastic waste product, which is 3.4 kg / trip. Mie Sedaap from Wings Group, Sprite, Coca Cola and Fanta from PT Coca Cola Bottling Indonesia, Gudang Garam Merah cigarettes from PT Gudang Garam Merah, Kapal Api coffee from PT Santos Jaya Abadi, GMP sugar from PT Gunung Madu Plantations and Supermi noodles PT Indofood CBP Sukses Makmur contributed plastic waste weighing < 2 kg / trip each. In terms of quantity, Gudang Garam Merah cigarette packaging contributes the most plastic waste to the sea, namely 1,905 packs/ trip, followed by Sedaap noodle packaging, which is 1,125 packs/trip. Masako flavouring from PT Ajinomoto Indonesia, Kapal Api coffee, Adi mineral water, Supermi noodles, Surya cigarettes from PT Gudang Garam, Indomik from PT Indolakto, Royco flavouring from PT Unilever Indonesia and Frisian Flag milk from PT Frisian Flag Indonesia contributed as much as > 400 plastic packaging in one fishing vessel trip duration.
4. **Management of plastic waste in fishing vessels.** Only 21 of the 104 vessels (20.2%) of the PPP Tegalsari fishing vessels carried out waste storage during the period of fishing operations at sea. The number has decreased to only 9 vessels (9%) sorting waste on daily and monthly trips

of fishing vessels at sea. This resulted in the amount of plastic waste leaking into the sea higher than the amount returning to land, which was 6.7 kg (12.1%).

5. **Implementation of Waste Reduction Maps by Manufacturers.** Multinational companies (Coca Cola Bottling Indonesia, Unilever, Otsuka, Ajinomoto and Frisian Flag) have a clearer commitment and achievement in the implementation of waste reduction by producers, compared to national companies (except Indofood) and local companies in Tegal City. This is because of the global target that is a reference for multinational companies to reduce the use of plastic in pre-consumption and post-consumption.

3.2 Recommendations

1. Manufacturing the largest contributor of plastic waste in the sea to the capture fisheries industry at PPP Tegalsari is expected to take part in reducing plastic waste and replacing packaging that is not environmentally friendly with packaging that is easily degraded, can be recycled and can be reused without harming marine life and the environment.
2. To support the Marine Plastic Waste Reduction program based on Presidential Regulation No. 83 of 2018, the central government and related agencies are expected to issue regulations accompanied by continuous socialization to the community to handle plastic waste on fishing vessels until the end of the fishing period.
3. The local government of Tegal is expected to issue a regional regulation issuing regulations restricting the use of single-use plastics and limiting the use of product packaging that is not environmentally friendly for local producers.
4. The port authority is expected to take part in socializing the SOP for Handling Marine Debris that has been made previously by the DFW Indonesia Team.

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APPENDIXES

Appendix I Questionnaire

QUESTIONNAIRE WASTE STATUS AND WASTE HANDLING ON THE FISHING VESSEL PPP TEGALSARI

Good morning/Noon/Afternoon Sir. Introduce us from the DFW Indonesia Team, currently conducting a survey on the Potential of Marine Debris and Product Brands from Fishermen Fishing Supplies at PPP Tegalsari. The purpose of this survey is to find out the estimated weight / volume and the list of fishermen's supplies that have the potential to enter the sea from activities

This survey takes about 5 – 7 minutes to complete. Please put a check mark on the box () answer choice in the column on the right. The selected answer is recommended more than one answer choice according to the conditions in the field. Please circle () one correct answer choice to the question of the size of food and beverage plastic packaging.

Thank you for your participation in filling out this questionnaire.

No.	Question	Answer
		Interviewer: _____
		No. _____ (filled in by the interviewer)
		Day/Date: _____
Socio-Demographics		
1.	Name	
2.	Age	year
3.	Recent education	<input type="checkbox"/> No school <input type="checkbox"/> SD / Equivalent <input type="checkbox"/> Junior High School / Equivalent <input type="checkbox"/> D1 / D2 / D3 <input type="checkbox"/> D4/S1 <input type="checkbox"/> S2
4.	Length of work	month/year
5.	City of domicile	
FISHERMEN'S SUPPLIES		
1.	Vessel name	
2.	GT vessels	<input type="checkbox"/> 30 GT > 30 GT <input type="checkbox"/>
3.	Vessel area	m ²
4.	Vessel fishing gear	<input type="checkbox"/> Cantrang Gill Net Bouke Ami Purse Seine <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
5.	Number of crew members	person
6.	Trip duration	day/month
7.	Number of trips	year

8.	Position	<input type="checkbox"/> Captain / vessel agent <input type="checkbox"/>	
9.	What kind of food do you bring with you when you go to sea?	<input type="checkbox"/> Snacks / snacks flavouring Salt flavouring <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Soy Sauce Sugar Sambal Egg Vinegar <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Wheat Tempe Tofu Coconut Milk Rice Kara <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Vegetable Seasoning kitchen Instant Noodles Cooking oil <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Other 1. 2. 3.	
10.	How many supplies did you bring?	1. Snacks 2. flavouring 3. Salt 4. Sugar 5. Soy sauce 6. Pepper sauce 7. Wheat 8. Tempeh 9. Know 10. Rice 11. Instant noodles 12. Cooking oil 13. Vegetable 14. Santan 15. Other 1. 2. 3.	1. bales large / medium / small* 2. large sachets (500 - 1000 gr), medium (100-250gr), small (9 – 22 gr) / cardboard 3. medium wrap, large/sack 4. medium wrap, large/sack 5. large sachets (400 – 600 ml), medium (100-250 ml), small (15-50 ml) / bottle 6. wrap (8-25 gr) / bottle 7. medium wrap (500-1000 gr, large (1500-2000 gr) / sack / cardboard 8. plastic / leaves 9. plastic / bucket 10. sacks/plastic 11. wrap/carton 12. wraps/jerry cans 13. sacks/plastic 14. sachets/bottles 15. Other 1. 2. 3.
11.	What are all the brands and sizes of plastic packaging supplies?	1. Snacks / snacks 2. Flavourings (Masako, Royco) 3. Salt 4. Sugar 5. Soy sauce 6. Pepper sauce 7. Vinegar 8. Wheat 9. Rice 10. Instant noodles 11. Cooking oil 12. Other	1. _____; cm ² 2. _____; gr/ carton 3. _____; gr/kg/sack 4. _____; kg/sack 5. _____; mL / cardboard 6. _____; mL / cardboard 7. _____; mL / cardboard 8. _____; kg/sack 9. _____; kg/sack 10. _____; gr/ carton 11. _____; litters/jerry cans

		1. 2. 3.	12. Other 1. _____; 2. _____; 3. _____;
12.	What kind of drink supplies do you bring when you go to sea?	<input type="checkbox"/> Mineral water <input type="checkbox"/> Coffee <input type="checkbox"/> Tea <input type="checkbox"/> Milk <input type="checkbox"/> Soft drinks (Coca-Cola / Sprite / Fanta) <input type="checkbox"/> Other 1. 2. 3.	
13.	How many supplies did you bring?	1. Mineral water 2. Coffee 3. Tea 4. Milk 5. Soft drinks (Coca-Cola / Sprite / Fanta) 6. Other 1. 2. 3.	1. large, medium, small glass/ bottle / box 2. plastic sachets are large (500–1000 gr), medium (100–450gr), small (20 – 80 gr) / bottle / cardboard 3. dip, sachet/(rough)box/bottle glass/cans 4. powder, liquid sachets/cans/boxes large, medium, small 5. plastic bottles are large, medium / glass cans / boxes 6. Other 1. 2. 3.
14.	What brand of plastic packaging and/or size ?	1. Mineral water 2. Coffee 3. Tea 4. Milk 5. Soft drinks (Coca-Cola / Sprite / Fanta) 6. Other 1. 2. 3.	1. _____; ml glass / bottle / box / Gallons 2. _____; gr sachet / ml glass / bottle 3. _____; gr sachet / ml glass, bottles (glass / cans), box/cardboard 4. _____; gr sachet / ml bottle 5. _____; ml plastic bottles, glass, box 6. Other 1. _____; 2. _____; 3. _____;
15.	What kind of supplies for bathing needs you	<input type="checkbox"/> Shower gel <input type="checkbox"/> Detergent <input type="checkbox"/> Shampoo	

	bring when you go to sea?	<input type="checkbox"/> Toothpaste <input type="checkbox"/> Toothbrush <input type="checkbox"/> Other <input type="checkbox"/> <input type="checkbox"/>	
16.	How many supplies did you bring?	1. Shower gel 2. Detergent 3. Shampoo 4. Toothpaste 5. Toothbrush 6. Other 1. 2. 3.	1. paper/plastic sachets/plastic bottles 2. sachets large (1000 - 1800 gr), medium (500 - 900 gr, small (44 - 53 gr) / bottle / jerry can 3. sachets (6 ml – 10 ml), large, medium bottles 4. large (200 – 225 ml) medium (75 – 190 ml) 5. plastic brush (80 – 190 gr) 6. Other 1. 2. 3.
17.	What brand of plastic packaging and/or size?	1. Shower gel 2. Detergent 3. Shampoo 4. Toothpaste 5. Toothbrush 6. Other 1. 2.	1. _____; gr sachet / pax/ml bottles / cardboard 2. _____; gr sachet / ml bottle 3. _____; ml sachets / plastic bottle 4. _____; ml 5. _____; Gr 6. Other 1. _____; 2. _____;
18.	Another kind of supplies you brought with you when you went to sea?	<input type="checkbox"/> Cigarette <input type="checkbox"/> Medicines <input type="checkbox"/> Straps <input type="checkbox"/> Oil <input type="checkbox"/> Jerry cans <input type="checkbox"/> Other <input type="checkbox"/> <input type="checkbox"/>	
19.	How many supplies did you bring?	1. Cigarette 2. Medicines 3. Straps 4. Other 5.	1. Wrap / pack 2. board/bottle 3. m / fruit 4. Other 5.

		6.	6.
20.	What brand of plastic packaging and/or size ?	1. Cigarette 2. Medicines 3. Sack straps/other 4. Other 1. 2.	1. _____; cm ² 2. _____; Gr 3. _____; m 4. Other 1. _____ 2. _____
21.	What kind of fishing supplies?	<input type="checkbox"/> Plastic fish wrapping <input type="checkbox"/> Dragnet <input type="checkbox"/> Diving rope bar <input type="checkbox"/> Rumpon rope <input type="checkbox"/> Other <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
22.	How many supplies did you bring?	1. Plastic fish wrapping 2. Dragnet 3. Diving rope bar 4. Rumpon rope 5. Other 1. 2. 3.	1. sheet/pack 2. fruit 3. m 4. m 5. Other 1. 2. 3.
23.	What brand of plastic packaging and/or size ?	1. Plastic fish wrapping 2. Dragnet 3. Diving rope bar 4. Rumpon rope 5. Other 6. 7.	1. _____; m ² 2. _____; m ² 3. _____; m ² 4. _____; m ² 5. Other 6. _____; 7. _____;

WASTE HANDLING		
7.	Do you hold waste while in a fishing operation? If it does not proceed to the next number If not, directly look at No. 18	<input type="checkbox"/> Yes No <input type="checkbox"/>
8.	What kind of waste shelter do you use?	<input type="checkbox"/> Black/white waste plastic <input type="checkbox"/> Waste bin <input type="checkbox"/> Fish plastic bag <input type="checkbox"/> Others: _____
9.	What is the amount ?	fruit
10.	Where do you put it?	<input type="checkbox"/>
11.	Do you do waste separation ?	<input type="checkbox"/> Yes No <input type="checkbox"/>
12.	Into what kind of sorting your waste?	<input type="checkbox"/> Two <input type="checkbox"/> Three <input type="checkbox"/> Four
13.	If not, why?	
14.	Do you reuse jerry cans, cardboard boxes, sacks, plastic cups, fishing gear and fishing aids and so on that can still be used?	Jerry Cans: Yes, Sometimes No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Cardboard: Yes, Sometimes No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Sack: Yes, Sometimes No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Plastic cups Yes Sometimes No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Others: _____
15.	What is the average amount of bags/volume/weight of waste brought back to the port?	bag/m3/kg
16.	What kind of waste do you return to the port ?	Food plastics 1. 2. 3. Plastic drinks 1. 2. 3. Plastic fishing / API / ABPI 1. 2. 3.

Appendix II Manufacturing and Product Brands of Supplies

No.	Manufacturing	Product Type	Brand
1.	Wings Group	1) Soy sauce	Sedaap
		2) Instant noodles	Sedaap
		3) Refreshments	Isoplus
	PT Sayap Mas Utama	4) Shower gel	Giv
		5) Creamy soap	Ekonomi
		6) Creamy soap	Wings
		7) Detergent	Daia
		8) Body Wash	Nuvo
		9) Shampoo	Emeron
2.	PT Lion Wings	10) Shampoo	Zinc
		11) Dish soap	Mama Lemon
		12) Toothpaste	Ciptadent
3.	PT Wings Surya	13) Oil	Sabrina
		14) Detergent	So Klin
		15) Soap	Lux
		16) Soap	Lifebuoy
		17) Shampoo	Lifebuoy
4.	PT Unilever Indonesia	18) Detergent	Rinso
		19) Shampoo	Clear
		20) Shampoo	Sunsilk
		21) Toothpaste	Pepsodent
		22) flavouring	Royco
		23) Soy sauce	Bango
		24) Sauce	Jawara
		25) Pepper sauce	Indofood
		26) Soy sauce	Indofood
		5.	PT Indofood CBP Sukses Makmur
28) Wheat	Bogasari Payung		
29) Instant noodles	Supermi		
30) Instant noodles	Indomie		
31) Instant noodles	Sarimi		
6.	PT Mayora Indah	32) Flavouring	Condiments
		33) Snack	Malkist
		34) Snack	Biskuit Kelapa Roma
		35) Mineral water	Le Minerale
		36) Coffee	Torabika
		37) Tea	Pucuk Harum
7.	PT Coca Cola Bottling Indonesia	38) Refreshments	Coca Cola
		39) Refreshments	Sprites
		40) Refreshments	Fanta
		41) Refreshments	Pulpy
8.	PT Ajinomoto Indonesia	42) Flavouring	Masako
		43) Flavouring	Sajiku
		44) Flavouring	Ajinomoto
		45) Soy sauce	ABC
9.	PT ABC President Indonesia	46) Sauce	ABC
		47) Instant noodles	ABC
		48) Pepper sauce	ABC
10.		49) Mineral water	Aqua

	PT Tirta Investama (Danone AQUA)	50)	Refreshments	Mizone
11.	PT Sugar Group Companies	51)	Sugar	Gulaku
		52)	Sugar	Crystal
12.	PT Santos Jaya Abadi	53)	Coffee	Kapal Api
		54)	Coffee	ABC
		55)	Coffee	Good Day
		56)	Instant noodles	Vigo
13.	PT Jaya Utama Santikah	57)	Oil	Sovia
		58)	Oil	Sedaap
		59)	Refreshments	ABC Lemon & Honey
14.	PT Sinar Mas Agro Resources and Technology	60)	Oil	Simas
		61)	Oil	Filma
15.	PT P&G	62)	Shampoo	Pantene
		63)	Shampoo	Head & Shoulders
16.	PT Ultra Prima Abadi	64)	Toothpaste	Formula
		65)	Snack	Tango
17.	PT Sari Enesis	66)	Refreshments	Vegeta
		67)	Refreshments	Adem Sari
18.	PT Indolakto	68)	Milk	Indomilk
		69)	Milk	Enaak
19.	PT Gudang Garam	70)	Cigarette	Matahari
		71)	Cigarette	Gudang Garam Merah
20.	PT HM Sampoerna	72)	Cigarette	Sampoerna Mild
		73)	Cigarette	Dji Sam Soe
21.	PT Budi Starch & Sweetener	74)	Wheat	Rose Brand
		75)	Oil	Rose Brand
		76)	Sugar	Rose Brand
22.	PT Sinda Budi Sentosa	77)	Refreshments	Lasegar
		78)	Refreshments	Larutan Cap Badak
		79)	Flavouring	Sasa
23.	PT Sasa Inti	80)	Pepper sauce	Sasa
		81)	Coconut milk	Sasa
24.	UD You Guys	82)	Salt	Top Dandut
		83)	Salt	Dang-Dut
25.	CV Arira Pangindo	84)	Snack	Kusuka
26.	Del Monte Foods	85)	Snack	Del Monte
27.	PT Siantar Top	86)	Snack	Gemez
28.	PT Mondelez Indonesia	87)	Snack	Biskuat
29.	PT Stanli Trijaya Mandiri	88)	Snack	Padi Mas
30.	PT Sari Murni Abadi	89)	Snack	Momogi
31.	PT Asia Sakti Wahid Foods Manufacture	90)	Snack	Hitari
32.	PT Dua Kelinci	91)	Snack	Pilus Sukro
33.	PT Motasa Indonesia	92)	Flavouring	Ladaku
34.	PT Saori Saus Tiram	93)	Flavouring	Oyster Sauce
35.	PT Miwon Indonesia	94)	Flavouring	Mi-Won
36.	PT Unichem Candi Indonesia	95)	Salt	Daun
37.	UD Sunflowers	96)	Salt	Matahari
38.	PT Susanti Megah	97)	Salt	Kapal
39.	PT Gunung Madu Plantations	98)	Sugar	GMP
40.	Delima Food	99)	Soy sauce	Delima
41.	PT Guna Cipta Multirasa	100)	Sauce	Grouse
42.	PT Indolapangan Sentosa	101)	Sauce	Mc Lewis
43.	PT Mangkok Mas	102)	Sauce	Sedap

44.	PT Sukasari Mitra Mandiri	103)	Vinegar	Sukasari
45.	PT Rasa Sari Jayamakmur	104)	Vinegar	Rasa Sari
46.	PT Sidola	105)	Vinegar	Dixi
47.	PT Sanco Indonesia	106)	Oil	Sanco
48.	PT Putra Mas Dua Saudara	107)	Oil	Fortune
49.	PT Wilmar Cahaya Indonesia	108)	Oil	Sania
50.	PT Salim Ivomas Pratama	109)	Oil	Bimoli
51.	PT Resto Pangan Utama	110)	Oil	Resto
52.	PT Majuan	111)	Oil	Majuan
53.	PT Budi Nabati Perkasa (Sungai Budi Group)	112)	Oil	Tawon
54.	PT Bina Karya Prima	113)	Oil	ForVITA
55.	PT Langgeng Aman	114)	Oil	Aman
56.	CV Surya Jaya	115)	Oil	Tomato
57.	PT Anugrah Semeru Abadi	116)	Oil	Primaco
58.	PT Okey	117)	Oil	Okey
59.	PT Pulau Sambu	118)	Coconut milk	Kara
60.	PT Tirta Adi Sejahtera	119)	Mineral water	Adi
61.	PT Arga Mazu	120)	Mineral water	Mazhu
62.	PT Sinar Sosro	121)	Mineral water	Prim-A
63.	PT Tirta Sari Cemerlang	122)	Mineral water	Tir-sa
64.	CV Zam-Zam Alget	123)	Mineral water	Zam
65.	PT Frisian Flag Indonesia	124)	Milk	Frisian
66.	Nestlé	125)	Milk	Omela
		126)	Milk	Bear Brand
67.	PT Javaprima Abadi	127)	Coffee	Luwak
68.	PT Sari Incofood Corporation	128)	Coffee	Indocafe
69.	PT Tirta Tresindo Jaya	129)	Tea	Pucuk Harum
70.	PT Gopek Cipta Utama	130)	Tea	Gopek
71.	PT Duta Serpack Inti	131)	Tea	2Tang
72.	PT Cahaya Tirta Rasa	132)	Tea	Tong Tji
73.	CV Budi Djaya	133)	Tea	Pendulum
74.	PT Gunung Slamet	134)	Tea	Poci
75.	PT Sariwangi Agricultural Estate Agency	135)	Tea	Sariwangi
76.	PT Otsuka Indonesia	136)	Refreshments	Pocari Sweat
77.	PT Central Java Daya Wiguna Indonesia	137)	Refreshments	OXGNdw
78.	PT Asiasejahtera Perdana Pharmaceutical	138)	Refreshments	Krating Daeng
79.	PT M-150 Indonesia	139)	Refreshments	M-150
80.	PT Tirta Alam Segar	140)	Refreshments	Ale-Ale
81.	PT Marimas Putra Kencana	141)	Refreshments	Marimas
82.	PT KAO Indonesia	142)	Detergent	Jaz
83.	PT Djarum	143)	Cigarette	Djarum Super
84.	PT Menara Kartika Buana	144)	Cigarette	Tower
85.	PT Gelora Djaja	145)	Cigarette	Djaja
86.	PT Kalbe Farma	146)	Medicine	Promag
87.	PT Tempo Scan Pacific	147)	Medicine	Bodrex
88.	PT Soho Industri Pharmasi	148)	Medicine	Diapet
89.	PT Henson Farma	149)	Medicine	Ultraflu
90.	PT Coronet Crown	150)	Medicine	Herocyn
91.	PT Konimex	151)	Medicine	Paramex
92.	PT Indo Abadi Sarimakmur	152)	Medicine	Koyo Cabe

93.	PT Industri Jamu dan Farmasi Sido Muncul,	153)	Medicine	Tolak Angin
94.	PT Deltomed Laboratories	154)	Medicine	Antangin
95.	PT Tempo Scan Group	155)	Medicine	Oskadon
96.	PT Sterling Product Indonesia	156)	Medicine	Panadol
97.	PT Bintang Toedjoe	157)	Medicine	Komix
98.	PT Kimia Farma	158)	Medicine	Paracetamol
99.	PT Metrofarm-Indonesia	159)	Medicine	Intunal
100.	PT Sanbe Farma	160)	Medicine	Sanmol
101.	PT Arteria Daya Mulia	161)	Dragnet	Arida
102.	PT Sari Plastik	162)	Fish plastic	Sari
103.		163)	Fish plastic	Super Ori
104.	PT Dolpin Putra Sejahtera	164)	Fish plastic	Onion
105.	PT Pertamina	165)	Oil	Mesran

Appendix III Marine Plastic Waste Manufacturing and Brands

Rank	Manufacturing	Rank	Brand	Weight (kg/trip)		
1.	PT Tirta Adi Sejahtera	1	Adi mineral water	10,26		
		3	Sprites	1,98		
		6	Fanta	1,61		
2.	PT Coca Cola Bottling Indonesia	7	Coca Cola	1,42		
			Pulpy	0,04		
		4	Mie Sedaap	1,91		
		9	Economy Cream Soap	1,27		
			Ciptadent toothpaste	0,28		
			Isoplus	0,23		
			Ciptadent toothbrush	0,08		
3.	Wings Group		Soy Sauce Sedaap	0,06		
			Daia Detergent	0,08		
			Emeron Shampoo	0,07		
			Nuvo Soap	0,01		
		4.	PT Sinar Sosro	2	Prim-A mineral water	3,38
				5	Red Salt Cellar Cigarettes	1,90
		5.	PT Gudang Garam		Solar Cigarettes	0,11
	Pepsodent toothpaste			0,64		
	Royco			0,50		
	Pepsodent toothbrush			0,27		
	Clear Shampoo			0,44		
6.	PT Unilever Indonesia				Bango Soy Sauce	0,14
					Sunsilk Shampoo	0,08
			Lifebuoy Soap	0,05		
			Lifebuoy Shampoo	0,06		
			Rinso Detergent	0,05		
7.	PT Indofood CBP Sukses Makmur	10	Supermi Noodles	1,08		
			Sarimi Noodles	0,57		
			Indomie Noodles	0,31		
			Blue Triangle Flour	0,18		
			Indofood Soy Sauce	0,01		
		8	Kapal Api Coffee	1,33		
		8.	PT Santos Jaya Abadi		ABC Coffee	0,10
			Good Day	0,06		
9.	PT Gunung Madu Plantations		Sugar GMP	0,63		
10.	PT Otsuka Indonesia		Pocari Sweat	0,54		