



VIET NAM PLASTICS WASTE STRATEGY

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<p>Abstract:</p> <p>The main idea of the thesis is to analyze the plastic in Viet Nam and the plastic waste impact on the environment, the economy, people in Viet Nam. After that, the government gave some policies as well as strategies for plastic waste in Viet Nam. The thesis is collected data from the Viet Nam Plastic Association and Ministry of Natural resources and environment to understand the plastic and the plastic waste in Viet Nam through chapter 1.</p> <p>One standard model for plastic waste recycling in Viet Nam is plastic beads to help reduce the amount of plastic waste in the environment. One famous strategy for reducing plastic waste is using banana leaf, fresh grass straws, dried grass straws, and rice flour straws to replace the plastic bag and plastic straws. This method is an achievement for plastic waste in Viet Nam.</p> <p>However, some exits in the plastic waste Viet Nam including the awareness of people, education, economic, technology, and recycling system. With Vietnam's quick industrialization as well as urbanization, the output of Vietnam's risky plastic waste has improved, which needs to be successfully managed shortcomings which are connected with the leachate from improperly built as well as managed landfills; plastic waste management is actually among the best authorities' goals in Vietnam.</p> <p>Besides, this thesis introduces one of the famous models of recycling plastic in Finland is recycling a plastic bottle. It can be applied in Viet Nam in the future and help reduce the number of plastic bottles to emits the environment in Viet Nam.</p> <p>The literature research was collected from books and other sources. The secondary data was collected from the Vietnam Plastic Association (VPAS) and the Ministry of Natural Resources and Environment in Vietnam.</p>	
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ABBREVIATIONS

PP	Polypropylen
PET	Polyethylene terephthalate
PVC	Polyvinyl chloride
PS	Polystyren
EPS	Expanded polystyren
BOPP	Biaxial Oriented Polypropylene
DOP	Dioctyl phthalate
RIC	International Resin Identification
CO	Company
LTD	Limited
MSW	Municipal Solid Waste
LEP	The Law on Environmental Protection 1993
3RS	Recycling, Reuse, Reduce
EPR	Extended Producer Responsibility
VGLP	Vietnam Green Label Program
ISO	The International Organization of Standardization
IGES	Institute for Global Environment Strategies
VPAS	Vietnam Plastic Association

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1. INTRODUCTION

Plastic is a ubiquitous and essential content in the economy of ours and every life. It is plenty of tasks that help tackle a selection of the problems facing the society of ours. Innovation and light content in automobiles or maybe planes save gas and bring down CO_2 emissions. High-performance insulation substances assist us in saving on electricity bills. In product packaging, plastics assist guarantee food safety as well as lower food waste. Combined with 3D printing, bio-suitable plastic materials can protect human life by allowing healthcare innovation [1].

Nevertheless, the way plastics are currently produced, used, and discarded fails to record the economic benefits of a more “circular” strategy and harms the planet. There is an immediate need to deal with today’s environmental concerns that cast an extended shadow over the generation, use, and consumption of plastics. The million tons of plastic-made litter that wind up in the oceans each year are one of their alarming and obvious most signs or symptoms of the problems, triggering raising public matter [1].

Based on the most recent statistics of the Ministry of Natural Resources and Environment, in Vietnam, plastic-made waste accounts for 7% of total solid waste products, equivalent to almost 2,500 tons per day time [2].

Every year, Vietnam emits ocean from 0.28 to 0.73 million many transparent plastic waste (accounting for 6 % of the entire planet), positioned 4th on the planet. The United Nations Environment Program announced at this international workshop on session on the formulation of a national action program for plastic-made waste management in the early morning of December 10. The top countries are the Philippines, Indonesia, and China, respectively. Thus, to get over from many of this, Viet Nam is searching for waste treatment technologies in addition to a strategy to fight it. From this strategy, Viet Nam needs to boost the value chain in the circular economic climate with diverse solutions and with the wish to recycle all the plastics [3]

Improving and rethinking the performance of such a complicated value chain requires greater cooperation and efforts by all the key players of its, from plastics creators to recyclers, consumers, and retailers. Additionally, it calls for the development and a shared perspective to get on the right path. The plastics business is crucial to the Viet Nam economic climate. Raising its sustainability can provide brand new possibilities for job creation, competitiveness, and

innovation, in series with the goals pursued by the restored Viet Nam Industrial Policy Strategy [1].

Moreover, the plastic industry is essential for the economy in Viet Nam. It is among the top country in the plastic market in Southeast Asia. Complete plastic material output in 2017 of our nation hit 6.7 million tons. Mainly, Home plastic, construction plastic, or plastic material used for electric technology products had good growth. The primary export markets of plastic items made in Vietnam are Japan and also the United States. Vietnam's issues in the plastic business are presently facing price instability because virtually all of the plastic components we have to import from abroad can lead to the cost reduction of extruded clear plastic products. Nevertheless, based on the evaluation, Vietnam is a potential market for plastic-made business development in Southeast Asia [4].

In this thesis, the writer use literature research to collect data from Viet Nam Industrial Policy Strategy and some reports relative to plastic in Viet Nam to clarify the general plastic and plastic waste, finding advantaged and disadvantaged as well as the problem in Viet Nam, after that finding the strategy for this problem. Besides, this research is used to compares with some countries to knowing the method using plastic waste in Asia.

1.1 RESEARCH AIM

The primary aim of this thesis is to try to describe overview the plastic waste in Viet Nam, after that analysis the actual station of Viet Nam's plastic waste and gave the strategy for using the plastic waste in this country.

1.2 RESEARCH OBJECTIVES

Plastic is a famous industry in Viet Nam, and many businesses used plastic to create many plastic products; however, their company does not have the method or strategy to waste plastic. The thesis's main objective is to describe the plastic waste and give the strategy to waste the plastic in Viet Nam.

1.3 OVERVIEW OF PLASTIC INDUSTRY IN VIET NAM TODAY

Polymer or plastics are essentially utilized as materials to create a range of items that add considerably to human life and enhance a selection of economic sectors and other industries as energy, electronics, telecommunications, transportation, fisheries, agriculture. Combined with the improvement of science and technology, plastics are usually utilized and become substitutes for standard components that seem irreplaceable, such as wood, metal, silicate. Therefore, the

plastics industry is often playing an immensely critical role in the lives of the nations' production [5].

In Vietnam, the plastic material industry is still brand-new compared to other long-standing industries as technicians, electricity - devices, chemicals, textiles. Still, there has been a good development. Recently, plastic-made industry throughout 2010 - 2015, will be really among the industries with most likely the largest growth rates in Vietnam with an annual expansion of 16% - 18% /year (only in the back of the telecommunications too as textile industries), with items the growth rate hit almost hundred % [5]. With a quick growth rate, the plastics industry is a highly effective marketplace in the Vietnamese economic climate. In 2015, the plastic business made and consumed almost 5 million tons of items. If apparent plastic goods per capita in 1990 just reached 3.8 kg /year, it has increased to 41 kg/year. This expansion shows that the need for plastic goods in the land is rising [5].

Many companies have established reputable products makes in the nation such as:

- Tien Phong Plastic Joint-Stock Company (NTP)
- Binh Minh Plastic Joint-Stock Company (BMP)
- An Phat Plastic and Green Environment Joint Stock Company (AAA)
- Ngoc Nghia Industry-Service-Trading Joint Stock Company (NNG)
- Dong Nai Plastic Joint Stock Company (DNP)
- Dong A Plastic Group Joint Stock Company (DAG)
- Rang Dong Plastic Joint Stock Company (RDP)
- Saigon Plastic Packaging Joint Stock Company (SPP)
- Tan Dai Hung Plastic Joint Company (TPC)

Some of the famous plastic company in Viet Nam is counted by Viet Nam Comprehensive Report in 2018 of Business Wire [6].

Plastic consumption per capita from 2010-2015

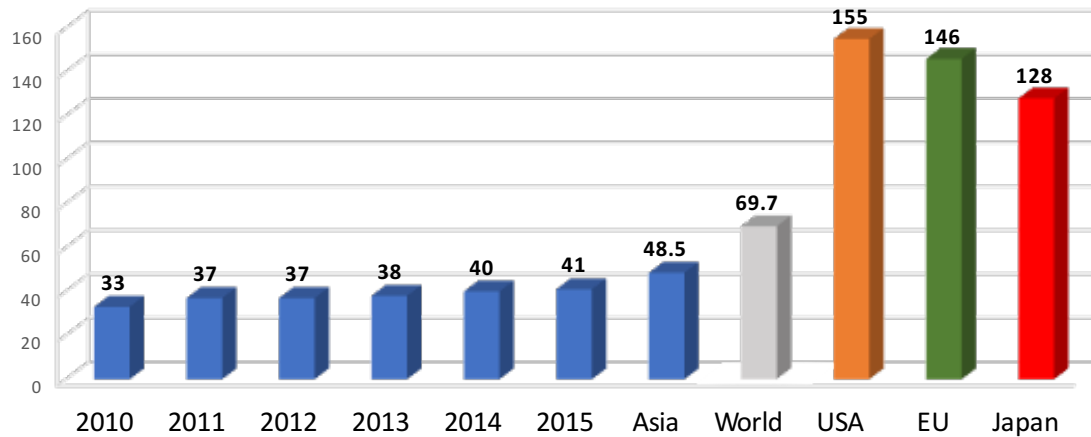


Figure 1: Plastic consumption per capita from 2010-2015 [5]

1.3.1 System of plastics businesses in Viet Nam.

Viet Nam has more than 2,000 enterprises stretching out from the North to the South and concentrating primarily in Ho Chi Minh. According to Viet Nam Report Joint Stock Company on 29 September 2020, they officially announced the ranking of top 10 plastic company for packing in Viet Nam depending on three main criteria: (1) Financial capability shown on probably the most recent economic report; (2) Media status is evaluated by Media Coding - encoding the company's articles on influential media channels; (3) The research subject, as well as stakeholders survey, was done in August 2020 [7].

1. An Phat Plastic and Green Environment Joint Stock Company (AAA)
2. Hung Yen Plastic Joint-Stock Company (HYP)
3. Tan Tien Packing Joint-Stock Company (TTP)
4. Trung Dong Plastic Joint Stock Company (TDP)
5. Tin Thanh Packing Joint-Stock Company (TTP)
6. Thuan Duc Plastic Joint-Stock Company (TDP)
7. Bao Van Plastic Joint-Stock Company (BVP)
8. Sadico Can Tho Joint-Stock Company (SCT)
9. Kim Duc Joint-Stock Company
10. Vinh Plastic Joint-Stock Company

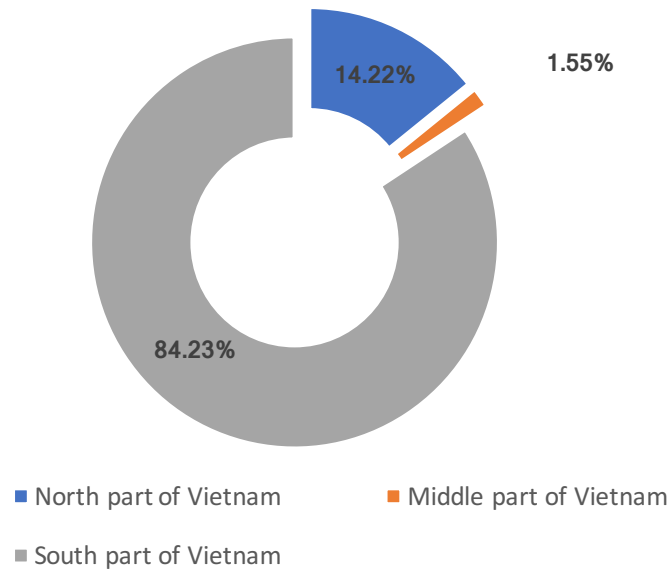


Figure 2: Plastic businesses in Viet Nam by Geographic [8]

The private enterprise is regarded as a powerful component of the economy; therefore, the transparent plastic business is actually among the powerful industries in the country ours. The powerful products of Vietnamese enterprises are packaging, customer plastic material items, high-tech plastic, and construction plastic products.

Plastic is used in many fields, but the packaging segment has probably remained the highest proportion in the plastic industry of Viet Nam. The plastic business is split into four parts based on Vietnam Plastic Association (VPA): technical, construction, consumer, and packaging segment. In what, product packaging has stayed probably the most significant proportion (37,43% in 2015) recently. This framework had a slight change compared to 2000-2005 when the quantity of construction plastic material accounted for a relatively high proportion (29,26 %). Nevertheless, construction business and technical slowdown after 2008 triggered a decline inside the ratio of development plastic material to 18,25 % and 15,06 % at current. Based on the plastic business growth program to 2020, the specific plastic business will be restructured towards reducing the proportion of product packaging and consumer plastic, raising the percentage of building and technical segment [9].

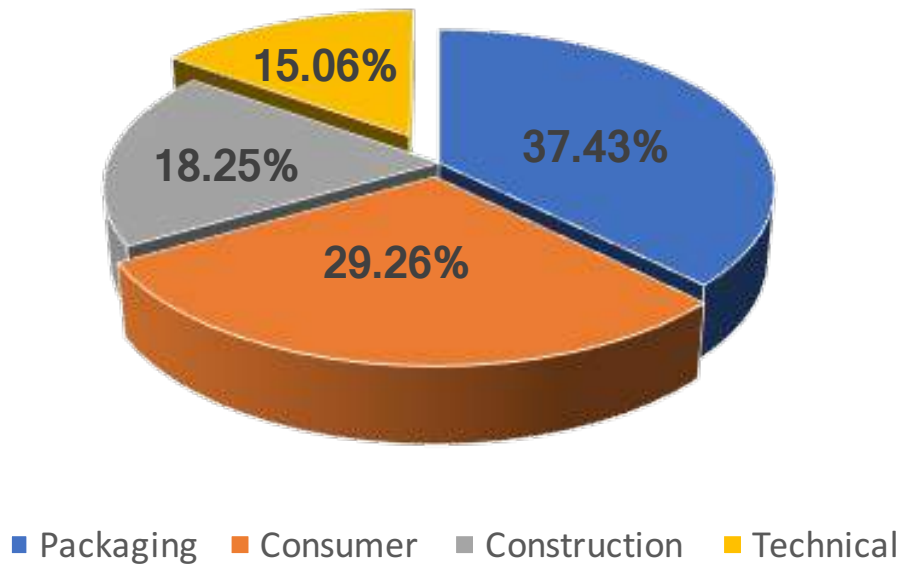


Figure 3: Plastic businesses in Viet Nam by industry [9]

According to figure 3, plastic material is applied for four areas as packaging, consumer, construction, and technical. Packaging products including soft, stiff (shopping bag, cosmetic pots, pets pot), consumer products (chairs, tables, other furniture), construction products (water pipes, water tanks, decoration, sheet, roof shelter), and technical products (pressure pipes, cover of television) [10]

The plastics industry with over 2,000 companies has grown clearly in recent years, with domestic sales and exports increasing year after season [10]. According to the Viet Nam Plastics Association, there is still much space for progress, though a lack of domestic source of raw materials is actually among the elements hindering it [11].

Furthermore, adding to the improvement of the plastic business is the functioning of foreign-invested enterprises. Even in other phrases, the plastic industry is turning into an attractive economic industry with international investment. Export growth mainly comes from global invested enterprises [12]. The explanation is that Vietnam's plastic products are not subject to anti-dumping tax rates imposed by Europe as China, Malaysia, and Thailand. Thus, Chinese, Malaysian and Thai companies shift to generation in Vietnam to avoid anti-dumping duties while import tax variations on items from China, as Vietnamese commodities export to Europe. Europe pays at least 10% under Chinese goods [5].

Especially from Japanese enterprises were seeking just investing in Vietnam's plastics business. On the one hand, the participation of foreign-invested companies will provide good

consequences such as modern technology, superior management expertise, improving export turnover for the industry. On the other hand, there will also be good competition for domestic business owners [13].

1.3.2 The main types of raw material in Viet Nam

Vietnam is actually among the world's frontrunners in packaging. Packaging made in Vietnam ranges from cardboard containers, soda cans, clear plastic wrapping, and far, a lot more [14].

The task of building the raw materials sector has not been created. The domestic market only offers around 900,000 lots of raw materials and additives due to the underdeveloped petrochemical industry, plastic-made recycling sector, which may meet only 20-30 % of components demand. Meanwhile, there are no specific statistics on the amount of particular plastic recycling industry. Additionally, fluctuations in the planet's cost of plastic resins will considerably affect plastic firm's overall performance [9].

Item No	Category	Company	Capacity (tons/year)	Noted
1	PP	Binh Son Petrochemicals Refining – One Member Co.Ltd	150,000	
2	PET	Hung nghiep Formosa LTD Co.LTD	145,000	
3	PVC	Phu my chemicals and Plastic Co.LTD	120,000	(since 2004)
		Chemicals and Plastic TPC Vina Co.LTD	300,000	(since 2010)
4	PS	Vietnam Polystyrene Co.LTD	48,000	(since 2012)
5	EPS	Vietnam Polystyrene Co., Ltd.	38,000	(expected total capacity 70,000 tons in quarter 2/2016)

6	BOPP	Hung Nghiep Formosa Co., Ltd.	60,000	(expected total capacity 90,000 tons in quarter 1/2016)
		Youl Chon Vina Plastic JSC	12,000	
		Euro Film Corporation	30,000	(expected in quarter 2/2016)
7		LG Vina Chemical Co., Ltd	40,000	(since 2003)

Table 1: Domestic enterprises producing plastic material [9].

Presently plastic made average industry necessity for PE, PP, and PS, genuinely accounting for around 3,5 million tons, do not point out many auxiliary chemic substances. Meanwhile, domestic tool fulfills approximately 900.000 a good deal of raw materials, chemicals, and additives of Vietnam plastic-made business demand [15]. By 2020 Vietnamese enterprises will import roughly 5 million raw materials for paper operations [9].

According to figure 4, PE and PP resins have stayed probably the highest proportion in import turnover with 30.7% and 22.8% by volume and 25.4% and 20.3% by value respectively because PP and PE are essential material to make the plastic product which is produced by Binh Son Petrochemicals Refining Co. Ltd [5].

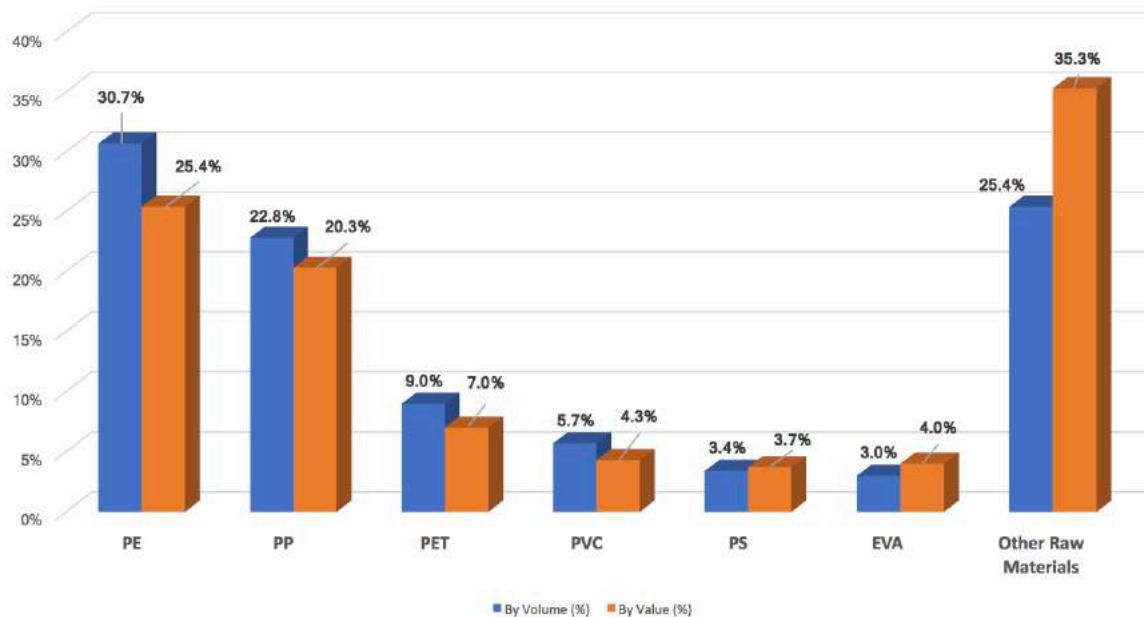
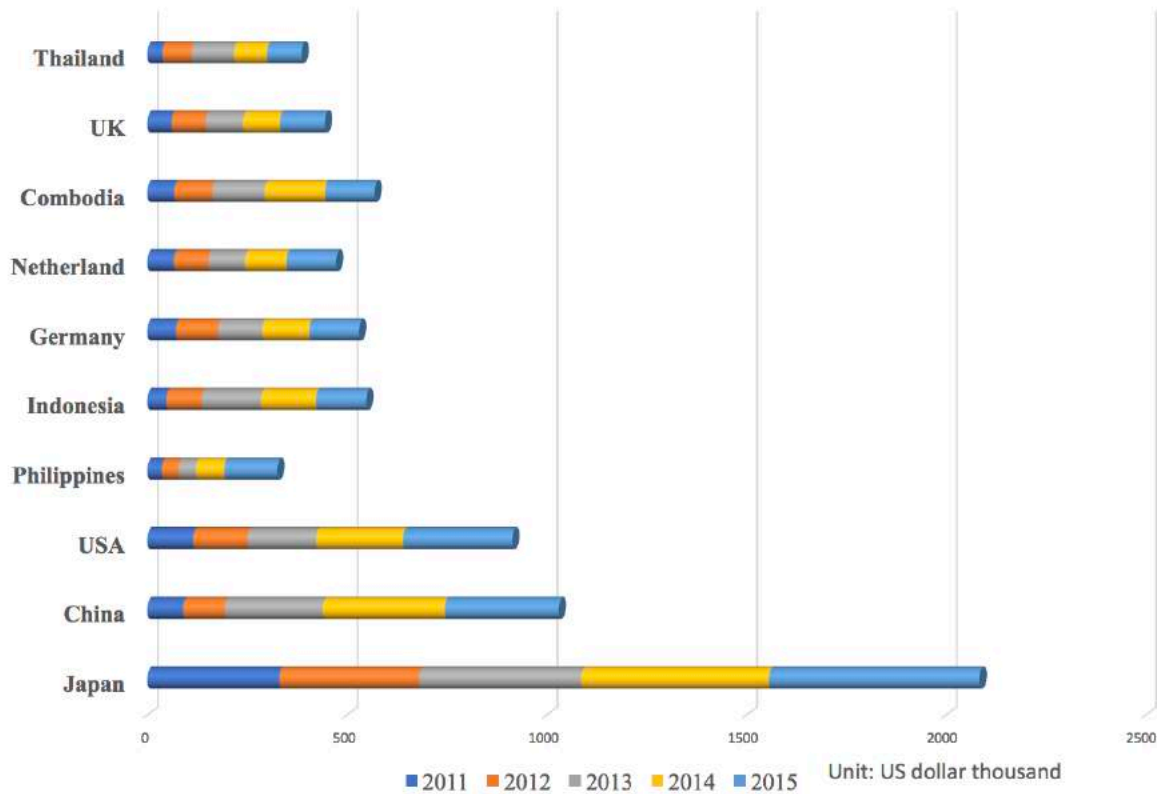


Figure 4: Structure of kinds of raw materials imported from 2010 - 2015 [5]

Besides, production costs in the plastic-made industry also fluctuate based on raw materials resources costs ups and downs, especially rates fluctuation of the two most used raw materials in a generation, that is, PP and PE with an average boost of 11,7 % through 5 recent years [10].

1.3.3 International market

Despite troubles in tasks, the Vietnamese plastic-made material industry is tiny by little, affirming its role in the economy. Harsh boosts of exports turnover recommended that Vietnamese plastic-made items are used in various nations on the planet and demonstrate the great worth of the marketplace within the typical enhancement of the whole enterprise. Over 80 % of plastics products manufactured in Vietnam currently count on virgin plastic material resins. Domestically, just seven plastic businesses are interested in plastic-made raw articles manufacturing, on the summary of 2000+ clear plastic material businesses in Vietnam [5]. At the 2nd Vietnamese plastic products are offered in more than 150 countries; territories like Japan, Cambodia, Laos, Thailand, China, India, Middle East, Africa, EU, US. [10]



Year	Japan	China	USA	Philippines	Indonesia	Germany	Netherland	Cambodia	UK	Thailand
2011	330.455	89.93	114.605	36.105	47.703	71.588	66.591	67.991	59.99	37.578
2012	349.86	104.183	136.356	41.826	88.097	105.769	86.469	94.69	85.914	72.924
2013	405.769	244.604	171.954	43.499	148.772	109.724	91.208	131.193	93.31	106.744
2014	470.496	306.31	217.433	70.953	138.155	118.404	104.309	151.094	92.843	82.402
2015	527.296	285.328	273.328	133.058	125.477	124.913	124.274	124.233	112.52	86.301

Figure 5: Major export markets of Viet Nam plastics products from 2010 – 2015 [5]

According to figure 5, Japan is the biggest country to import plastic products from Viet Nam from 2010 – 2015, China and the USA (527.296, 285.772, and 273.328 US Dollar thousand respectively) [5]. There was a dramatic growth in the number of exportation in Japan to 330,455 US Dollar thousand in 2011, followed by a sharp increase to 527,296 US Dollar thousand in 2015 [5]. So far, Vietnam’s main exports are actually including plastic-made items categories such as plastic-made sheets, pellets; home plastics; fittings and pipes; sanitary items; plastics utilized in creating industry; packaging; customer plastics: stationery, handicraft, beauty products, toys. [10].

As before, plastic-made generation in Vietnam mainly served usage in the domestic store; after 2001, Vietnamese plastic items have been exported to the earth market. Presently, Vietnamese plastic-made products are made in 151 markets globally, including markets that need high quality, technical standards are Japan, the US, and the EU. There are 530 plastic businesses in Vietnam operating in the export sector, of which FDI businesses account for 60% of the

industry's export printer. The traditional export market of Vietnamese plastic-made companies is Japan (accounting for 22.1 % of export turnover); the USA 14.6 %; several European nations (the Netherlands 5.9 %; Germany 5.8 %; England 4.9 %) ASEAN and (Cambodia 5%; Indonesia 3%; Philippines 2.5%) [5]. Recently, Korea has turned into a big export industry, with the proportion of export turnover accounting for 3.9 % of Vietnam's complete export turnover of plastic-made products [5].

2. THEORETICAL

In the first part of this chapter, relevant theories about plastic and plastic waste include their definitions and classification to understand the structure. The second part relationships with a literature review to sum up the conceptual foundation and ground used to develop this thesis.

2.1 PLASTIC IN GENERAL

According to Zainul Huda and Robert Bulpett, they said that the phrase polymer refers to parts that are many. A polymer contains numerous chemically bonded parts or maybe devices bonded together to develop a solid [16]. Plastic is polymers, but polymers do not need to be plastics. Plastic is synthetic materials, which would mean they are synthetic or perhaps manufactured. Synthesis implies that “something is put together” [16]. They usually come from oil (natural gas or petroleum), though they also can come from other raw materials like banana peels, corn, or wood fibers! Each of these tiny molecules is widely known as a monomer ("one part") since it is capable of joining along with other monomers to create long molecule chains known as polymers ("many parts") during a chemical response called Polymerization [16]. Plastics are classified into two groups according to what goes on to them when heated to high temperatures. Thermo-plastics keep their plastic-made properties: They melt when warmed up and then harden once again when cooled. If they're exposed to heat that is enough, they will crack or even become charred [16].

Plastics are a team of substances, whether synthetic or perhaps naturally occurring, formed when very soft and next hardened to retain the specified condition. Plastics are polymers [17]. The term polymer comes from 2 Greek words: poly, which means numerous, meros, representing units or parts [18]. A polymer may be regarded as a chain in that every link is the "mer," or maybe monomer (single unit) [19].

Some plastics are derived from natural materials like animals, plants, and insects, but most are human-made. These are named Synthetic Plastics. The majority of human-made plastics are available from crude oil, but natural gas and coal are used. When crude oil is refined, gasses are given off. The gasses are broken down into Monomers. These are synthetic materials comprising of a single molecule. Many of these are linked together in a procedure known as Polymerization to develop new compounds known as Polymers [20].

From a simple molecular standpoint, polymers are crosslinked or un-crosslinked either. Nevertheless, polymeric materials are actually categorized as possibly thermoplastics,

elastomers, or thermosets. For elastomers, the crosslinking procedure is described as vulcanization. These crosslinked materials cannot be re-melted after solidification [21].

- Thermosetting Plastics
- Thermoplastic
- Elastomers

2.1.1 Thermosetting Plastics and Crosslinked Elastomers

Thermosetting and some elastomers are polymeric components that could crosslink. The crosslinking can cause the substance to refuse heat after solidification. A far more in-depth reason for the crosslinking chemical reaction happens during solidification. Crosslinking usually is a consequence of two-fold bonds breaking, enabling molecules to backlinks with the neighbors of theirs. One of probably the oldest thermosetting polymers is phenol-form-aldehyde and phenolic [21].

Thermosetting plastics are made up of collections of molecules that are extensively crosslinked. It results in a strict molecular structure. They could be warmed up the very first time and then shaped though they start to be solid and stiff permanently. They cannot be reshaped again [22].

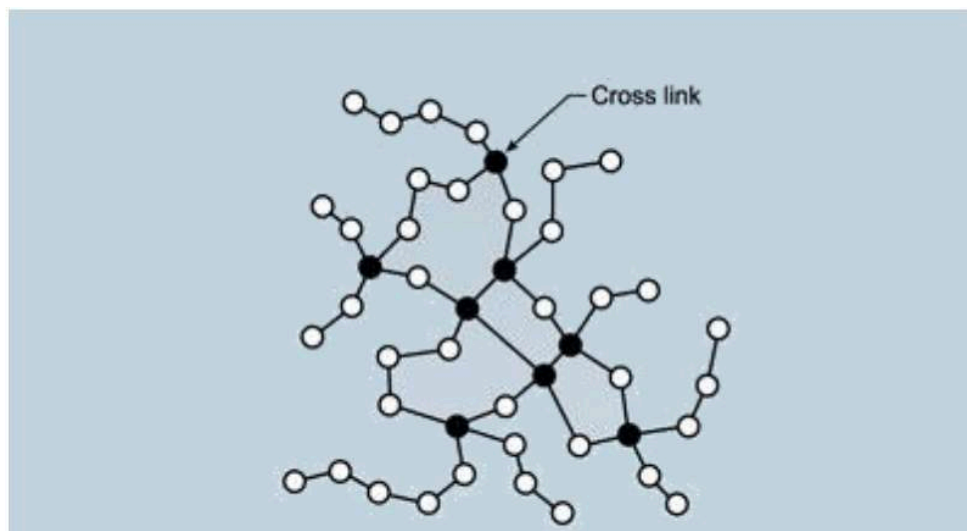


Figure 6: Thermosetting plastic [20]

2.1.2 Thermoplastic

Thermoplastics are polymers that soften and flow upon heating; they get difficult once again when cooled. This cycle could be repeated numerous times, making reprocessing during manufacturing or perhaps recycling after consumer use likely using heat fabrication methods including molding or extrusion. While there are many different synthetic kinds of

thermoplastics, those produced from just four monomers (ethylene, styrene, propylene, and vinyl chloride) account for approximately 90% of all thermoplastics the United States [23].

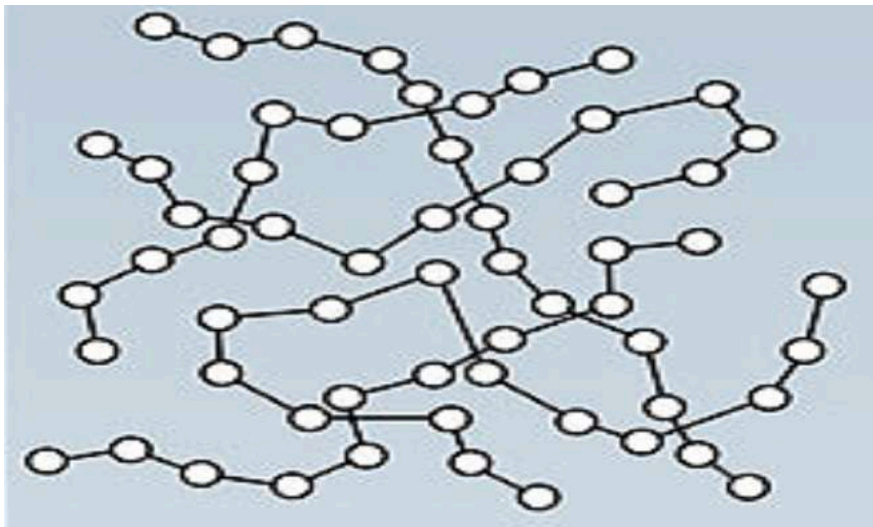


Figure 7: Thermoplastic [20]

2.2 TYPES OF PLASTIC THAT CAN BE RECYCLED OR NOT

For the limitation and sustainable development of environmental impacts to be a realistic objective, *reducing* the now growing usage of non-renewable natural resources, *reusing* things following consumption and proper *recycling* of discarded residues are actually of supreme importance [24]. The best practical application of the "3R" idea is essential for the burning of carbon-releasing power resources lessened [24]. Several reports have suggested that, even if most emissions of CO₂ as well as the other greenhouse gases have been stopped quickly, the climate changes which have previously occurred on the earth will stay for years. Since thermodynamics and engineering training is not possible to end such emissions entirely, work has to be made to lessen the chances to the ecosystem each time the opportunity arises [24].

Plastic items are made up of various forms of resins that are usually identified using symbols is printed on products. A typical standard used is the ASTM International Resin Identification Code (RIC), created in 1988 by the Society of the Plastics Industry and today administered by ASTM International, a worldwide standards organization [25].

The public usually assumes that the RIC codes suggest recyclability, but this is a misperception. The recyclability of a transparent plastic device will depend on regional recycling infrastructure. Only some labeled plastic-made products could be reused. For instance, RIC code '7' is a catch-all category in which the kind of plastics polymer used is not any of the RIC codes from 1 to 6. In the US, plastics items labeled seven are usually not recyclable. Notably,

RIC codes had been put together to "meet the requirements of manufacturers and recyclers for a regular, even coding process which may be utilized worldwide" and not as a comprehensive communication to customers to indicate recyclability [26].



Figure 8: Types of plastic that can be recycled or not [27]

2.3 WHAT IS RECYCLING PLASTIC

The concept behind recycling is breaking down finished products, creating their component supplies, and using those supplies as feedstock to produce new products [28]. Based on the precise plastic waste supply, the recycling process and the finished product differ [28]. Generally, plastics may be reused a specific amount of times before they are very degraded for further use [28]. Presently, all pre-consumer plastic trash is given back into the plastic generation stream, but just a tiny part of post-consumer plastic waste is reclaimed for its classic use [28]. Nevertheless, every little bit of recycled plastic brings down the demand for brand new plastic feedstock and reduces the volume of energy and power used for its creation [28].

Recycling plastic for use in producing new high-quality plastic items requires that the recycled resources are clean and consist of just a single plastic-type [28]. In such instances, the recycled apparent plastic substitutes for virgin plastic material [28]. Recycling or perhaps mixed plastic is a lot more complex [28]. The challenge in coping with the recycling of large numbers of a blend of various forms of contaminated plastics has to be looked at using an integrated way to supply reduction, recycling, and reuse [28].

2.4 STAGES IN PLASTIC RECYCLING

Raju Francis said that there are many stages of recycling:

- Collection: Plastic waste is collected from different locations that may be accomplished by having beautiful containers at home, farms, public places, and moved to the recycling sites [29].
- Cleaning: the cleaning phase consists of cleaning and drying the plastic pieces. Cleaning is crucial since fresh waste materials fetch much better rates and enhance end solutions quality. Plastic can easily be cleaned at different recycling phases: before, after, or perhaps even during shorting [29].
- Shorting: this involves not just the splitting up of the polymers from recoverable overseas bodies but additionally the splitting up of the polymers themselves [30].
- Size reduction: It is designed to minimize the dimensions of the waste, which facilitates the splitting up of various polymers and the recovery of the micronized powder that is utilized to feed processing devices [29]. The end products of shredding could be irregularly shaped parts of plastics that may be offered to reprocessing workshops and industries [29].

After processing, these substances are further subjected to different methods such as film molding, blow molding, injection molding, and extrusion. Lastly, the processed materials are converted into other items like miscellaneous items, sheets, bags, tubes, and pipes [29].

3. METHODOLOGY

This chapter discusses the research methodology and secondary data used in this thesis. The first part is the literature review to define the theory of plastic, plastic waste, and the plastic waste impact on the economy, the environment, society in Vietnam to find the strategy to solve the plastic waste. The main method is used literature method by reading a book, report, and especially collecting data from Vietnam Plastic Association (VPAS) and Ministry of Natural Resources and Environment in Vietnam.

3.1 LITERATURE REVIEW

The main research idea of the thesis was basically to give the strategy of plastic waste in Viet Nam; thus, it was essential to discuss the literature behind it and how it works. It appears that the theoretical basis involves the plastic definition of Myer Kutz [16] [31] and waste management of plastics residues through plastic recycling [32], which are discussed in chapter 2. Most of the data were collected from the Vietnam Plastic Association (VPAS) and the Ministry of Natural Resources and Environment in Vietnam. Finally, giving the strategy for plastic waste in chapter 6 [33] with different reports, studies, and several other sources.

3.2 RESEARCH METHOD

The basic objective of the thesis was to determine the plastic waste strategy in Vietnam. To provide a precise conclusion, the writer has selected a literature research approach for this research. Since the author wants to find all the effects of plastic waste on the industry in Vietnam, thought Vietnam Plastic Association and Ministry of Natural Resources and Environment. Then the author saw the real situation about Plastic waste in Vietnam, after that discussing the strategy about Plastic waste in Vietnam in chapter 6.

3.3 DATA COLLECTION PROCESS

This part introduced the process of collecting secondary data for this research. First, the author managed the plastic consumption per capita from 2010 – 2015, plastic businesses in Vietnam by Geographic and industry to identify the plastic industry which is most important in Vietnam. Second, the writer collected the data of plastic waste's effect on the environment, especially, the ocean, terrestrial, in chapter 5 is one of the most common problems in Vietnam through data the writer collected. Finally, the author managed the report and the local Department of

Natural Resources and Environment policies to saw the advantage and disadvantages of plastic waste in Vietnam.

4. VIET NAM WASTE MANAGEMENT ISSUE.

The interaction between humans and the Earth is a complicated event. The Earth 's capability to help humans is determined by the everyday food needs and our amounts of resource use, the quantity of misuse generation, and technologies used to alter utilization patterns. The earth 's environmental assets are insufficient to maintain the demands of ours and economic activities. Climate change has underscored the risk of overstepping the Earth 's capacity to take in the waste products. Additionally, the effects of exceeding the sustainable source of vital energy and just how much we already moved in this specific chain are also not adequately realized and usually approached in an industrial and economic mindset. Landfilling is perhaps the oldest structured waste management technology [34].

Rapid economic development has spurred industrialization and urbanization in Vietnam, increasing use and magnifying Vietnam's waste management problem. Increased waste development per capita substances to the current problem of improving population. A lack of insufficient state and institutional capacity derived resources leads to low-capacity and inefficient collection and disposal methods, low compilation rates and inadequate waste management facilities [35].

4.1 VIET NAM WASTE POPUTION IN RURAL AND URBAN.

Vietnam is additionally experiencing rapid urbanization. In 2018, there have been 828 urbanized areas/cities in the land, including two municipalities, nineteen grade I, twenty-four grades II, forty-six grades III, eighty-five levels IV, 652 levels V cities; along with the urbanization fee reached 38.4 % (increased from 26.5 million individuals (accounted for 30 %) to approximately 33.8 million individuals in 2018 (accounted for 36 %) [36].

Rapid population growth, urbanization, and industrialization have resulted in a substantial rise in waste generation, particularly in urban sound and clear plastic waste in Vietnam [36].

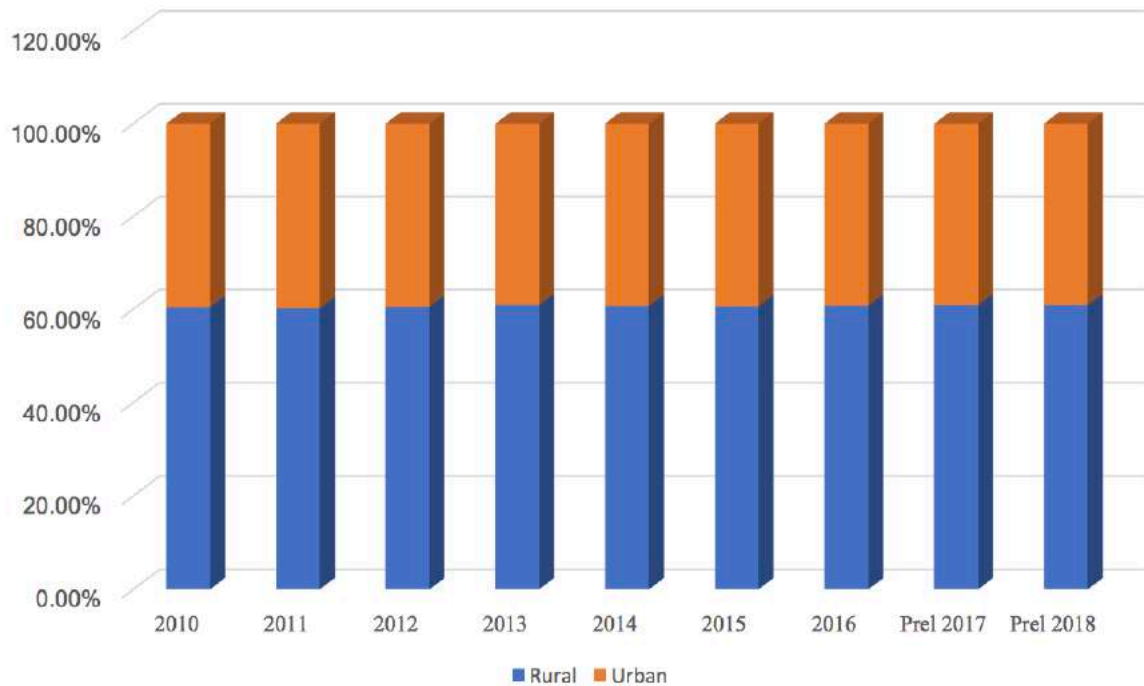


Figure 9: Viet Nam population 2010-2018 [36]

4.2 VIET NAM PLASTIC WASTE IN GENERAL

Globally, 322 million tons of plastic were produced in 2015, and the production and consumption of plastic products made up nearly 5 million tons in 2015 in Viet Nam. In 1990, plastic consumption year capita only was 3.8 kg/year; however, it increased fast to 41kg/year in 2015 [5].

4.2.1 VIET NAM PLASTIC WASTE TO OCEANS.

According to Our World in data, to recognize the magnitude of feedback of plastics to the natural environment and the world's oceans, there are a variety of components of the plastic generation, distribution and waste management chain. It is essential to realize the scale of the issue and apply the best interventions for reduction [37].

The information as well as visualizations that follow in this particular entry supply this introduction step-by-step. This overview is summarized in figure 10.

Right here, we realize that in 2010:

- International key generation of plastic was 270 million tones [37];

- International plastic trash was 275 million tones - it did meet or exceed yearly central generation through wastage of plastic from earlier years [37];
- Plastic waste produced in coastal areas is very in danger of putting in the oceans; in 2010, coastal plastic trash - generated within fifty kilometers of the coastline - amounted to 99.5 zillion tones [37];
- Only plastic waste that is improperly handled (mismanaged) is actually at substantial threat of leakage to the environment; in 2010, it amounted to 31.9 zillion tones [37];
- Of this, 8 million tones - 3% of worldwide yearly plastics trash - entered the seashore (through numerous outlets, which includes rivers) [37];
- Plastics in the oceans' surface area waters are numerous orders of magnitude lower than yearly ocean plastic-made inputs. This discrepancy is referred to as the 'missing plastic-made problem and is talked about in this case [37].
- The quantity of plastic material in surface waters is unknown: estimates range from 10,000s to 100,000s tones [37].



Figure 10: The pathway by which plastic enter the world's oceans [37]

There are no official statistics if plastic waste; however, Viet Nam has been reported to be the fourth in the top five countries in marine plastic waste generation and discharged around 0.28-0.73 tons of marine plastic debris annually. According to a World Bank study, lower-middle-income countries, including Vietnam, have a percentage of plastic waste of 12% of total municipal solid waste. MONRE (Ministry of natural resources and environment of the socialist republic of Vietnam) also estimated that plastic waste accounts for about 8-16% of the total

going into a landfill [38]. It is estimated that the number of plastic bags used is over 30 billion bags per year, and only a small proportion of about 17% of the bags are regularly reused; the rest becomes waste after a single-use. Two big cities, Hanoi and Ho Chi Minh City generate an average of 80 tons of plastic waste and bags per day. Plastic bags account for 7-8% of the waste generated in Ha Noi and about 10% in Ho Chi Minh City [38].

According to figure 11, the picture shows the list estimating feedback of clear plastic to the oceans from the most polluting waterways across the globe. It was estimated by Lebreton et al. (2017) for the season 2015. They are mentioned in order with the title of the river, and the nations through what it goes by [39].

The top twenty polluting rivers accounted for two-thirds - 67% - of the worldwide annual river feedback. Geographically we realize that the vast majority of the most polluting waterways are actually put in Asia. River Yangtze, the best contaminating river, had an input of roughly 333,000 tones in 2015 - more than 4% of yearly ocean plastic pollution [37].

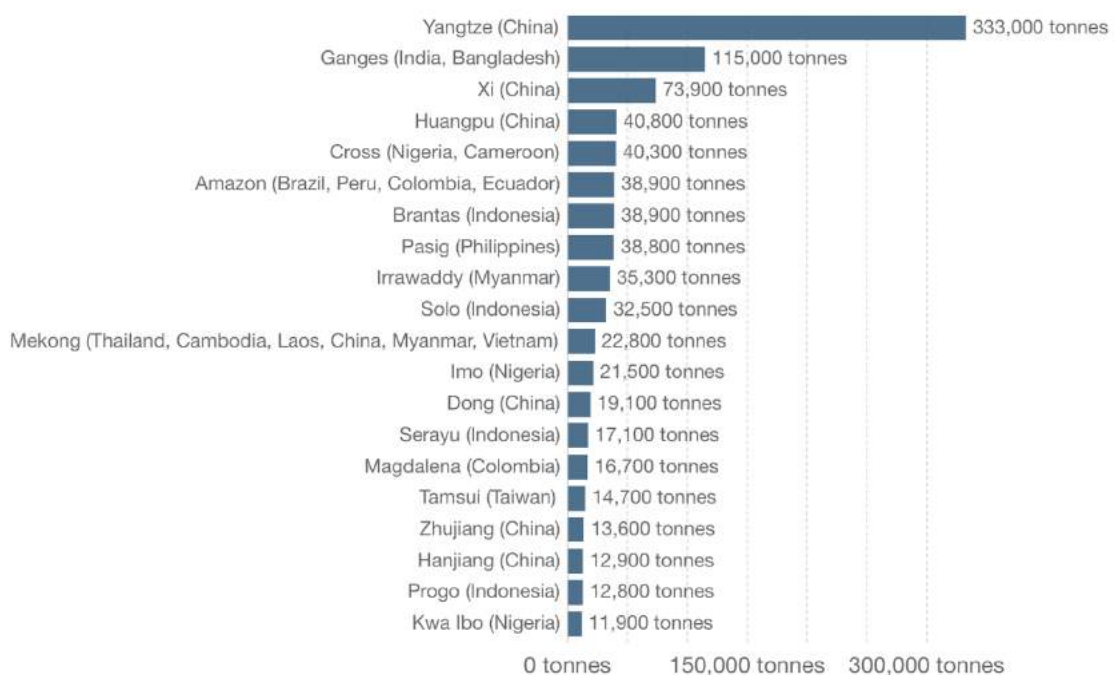


Figure 11: Plastic ocean input from top 20 rivers in 2015 [37]

The application of continual plastic bags and plastic items, particularly disposable plastic products, has left unforeseen effects on the earth. Plastic waste is a lot on the bottom part of the ocean and can be a food poison to pollute marine creatures. One-time utilization of plastic devices and plastic bags is the primary cause of the rapid expansion in plastic waste. Remarkably, the amount of clear plastic bags discharged into the earth have been increasing

year by season. Out of 660 landfills of much more than 1-hectare size, just 120 landfills are hygienic. Landfills in cities are constantly overloaded, constantly the danger of air and water pollution.

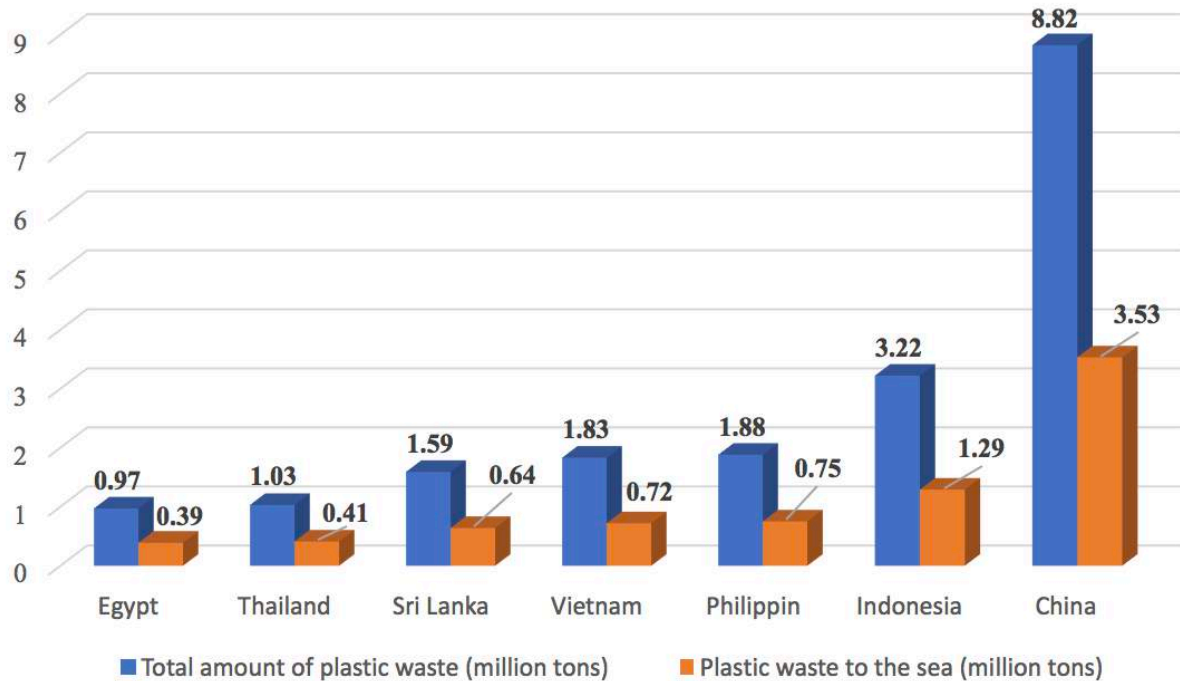


Figure 12: Amount of plastic waste and release into the sea [40]

The daily level of plastic waste is estimated at almost 18,000 tons, with approximately 1.8 million tons per season, and is actually among the top five nations discharging waste into the sea by the Vietnam Ministry of Construction. A comparison with many countries shows that Vietnam is actually among the nations with probably the highest length of clear plastic waste and seashore trash by the Vietnam General Department of Environment in 2019 [40].

Vietnam has more than 3260 km of coastline from the north to the south, along with many islands. Vietnam's population can be generally concentrated on coastal areas and islands. Now with the solid improvement of coastal cities. Vietnam's seas, and islands face far more and more issues of pollution risks that are primarily brought on by human events.

In 2010, Vietnam had 1.8 million a lot of unmanaged plastic trash, with an estimated 0.73 million a lot of its squandering ending up in the seashore. It is not a tiny number whenever we rank fourth in the nation with probably the most significant length of plastic waste on the planet [3].

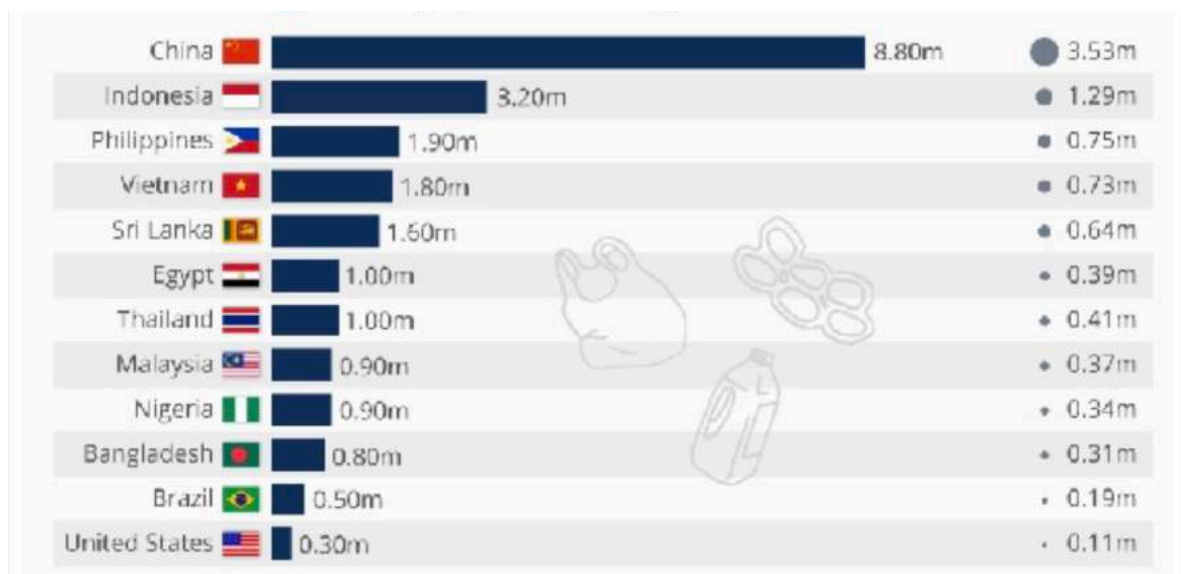


Figure 13: Top countries that pollute the most plastic waste in the sea [3]

Vietnam emits oceans from 0.28 to 0.73 million a lot of clear plastic waste (accounting for 6% of the world), positioned 4th on the world - the representative of the United Nations Environment Program announced at this international workshop on session on the formulation of a national action program for plastic waste management in the early morning of December 10. The best lands are the Philippines, Indonesia, and China, respectively [3]. A report of the Saigon River proved 172,000 - 519,000 microfiber/ m^3 off the water, micro-plastic film, and 10-233 pieces / m^3 of drinking water [41].

Generally, the sources of marine contamination in Vietnam are currently primarily human-caused. Industrial zones, and the subconscious discharge of individuals have created our sea no longer fresh. The practice of seeing the ocean as a great landfill still exists in numerous subconscious areas of a tiny part.

4.2.2 VIET NAM PLASTIC WASTE TO TERRESTRIAL

Based on the most recent statistics of the Ministry of Natural Resources and Environment, in Vietnam, plastic waste accounts for 7% of total solid waste products, equivalent to almost 2,500 tons/day time [5].

According to Mr. Bui Trong Hieu (chairman of the board of Ho Chi Minh city urban environment company), Vietnam is actually among the top countries that discharge plastic waste too much into the environments reported by international environmental organizations.

Besides that, Mr. Bui Trong Hieu shows that Ho Chi Minh emits approximately 8,900 tons of daily-life solid waste. Mainly, plastic waste accounts for approximately 1,800 tons, including plastic, nylon. Moreover, of these 1,800 lots of plastic waste products, just approximately 200 tons are recycled but primarily with backward technology, so there are many environmental issues; the remaining plastic waste is buried with other additional waste products [41]. Moreover, Associate. Professor. Dr. Le Hung Anh, Director of Institute of Science, Environmental Management and Technology, Ho Chi Minh City Faculty of Industry, also stated that based on statistics, Vietnam ranked fourth in the terminology of plastic waste emissions in the world [41]. There are two sources of micro-plastic pollutants: chief energy sources because of explicit plastic resin creation, coarse know-how, 3d printing, beauty products. The secondary energy sources result from decay from large plastic trash because of UV, high heat, as well as living. [41].

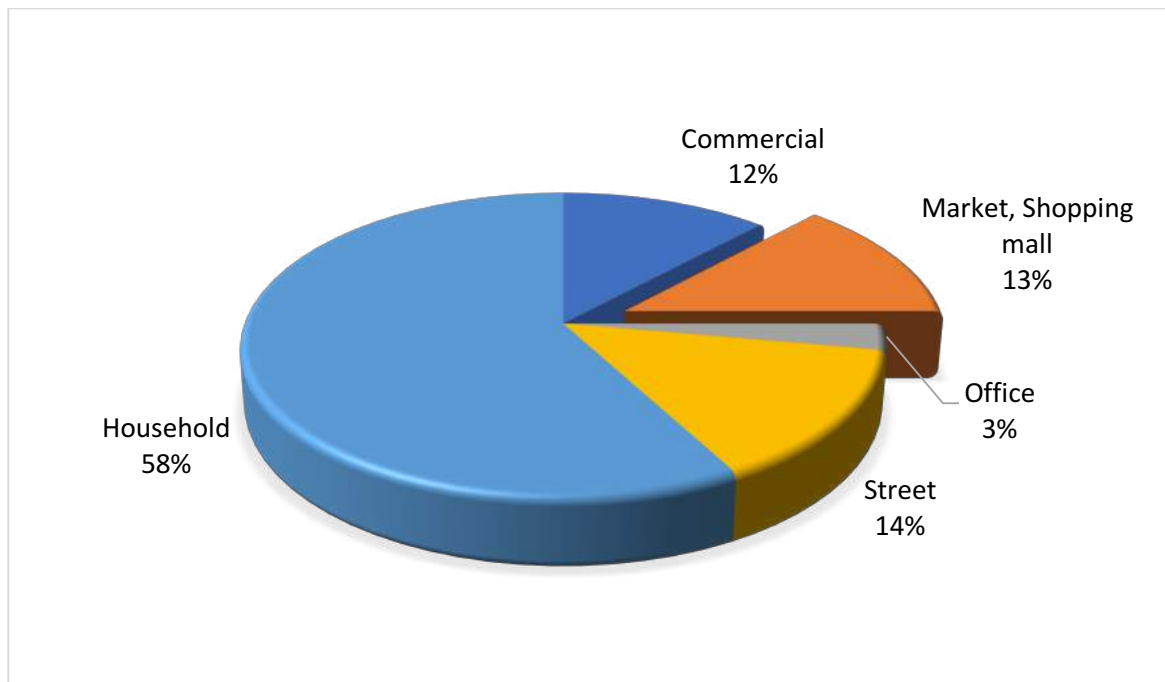


Figure 14: The graph shows the amount of solid wasted (including plastic waste) from waste source in Viet Nam [5]

5. RESULT OF PLASTIC WASTE DISPOSAL IN VIETNAM

In chapter 4, the writer shows the affection of plastic waste into the environment, especially ocean and terrestrial. Vietnam discharged 8-16% plastic waste into the landfill and appropriated 6% of the world's plastic waste, which discharged into the ocean that was reported by MONRE (Ministry of natural resources and environment of the socialist republic of Vietnam). Moreover, the Vietnam Ministry of Construction reported that the daily level of plastic waste is estimated at almost 18,000 tons, with an amount of approximately 1.8 million tons per season, and is actually among the top five nations discharging waste into the sea. The number of plastic bags used is over 30 billion bags per year, but only a tiny proportion of about 17% of the bags are regularly reused; the rest becomes waste after a single use [38]. From this data in chapter 4, plastic waste disposal is one of the biggest concerns in Vietnam. In this part, the writer gives the strategies of plastic waste disposal for the ocean and terrestrial, the government-supported, and raising the Vietnamese's awareness about reducing plastic waste in daily their life.

5.1 THE STRATEGIES OF PLASTIC WASTE DISPOSAL IN TERRESTRIAL.

A report in 2018 that 3% and 12.4 % of solid waste produced in Hanoi city and Ho Chi Minh city, are plastics [42]. It is believed that approximately 20% of plastic waste produced is collected and recycled [43]. Meanwhile, approximately 8-16% of plastic waste in landfills is plastics waste [36]. It indicates a minimal recycling fee, relative to developed nations which possess regulation which encourages plastic-made recycling, and they have recycling rates around 30% [44]. The writer will show the strategies of plastic waste disposal in terrestrial in this section, the first part of this chapter will show the process of recycling plastic waste in Vietnam, second part writes about using green material to replace the plastic bag, the combination of collecting plastic waste in Vietnam and the process of bottle recycling "Pantti." The final part will give the support of the government, awareness of Vietnam people.

5.1.1 Recycling plastic waste in Vietnam.

Vietnam does not have many recycling methods; one of the well-know methods of recycling plastic waste is the plastic bead in Nghe An which the Ministry of Trade and Industry supports. In this part, the writer shows recycling plastic waste and the benefit of recycling plastic waste in Vietnam.

5.1.1.1 The process of recycling plastic waste in Vietnam

Vietnam has 274 small recyclers located in a residential area and small craft industries, and 11 recycling businesses located in the industrial zone.

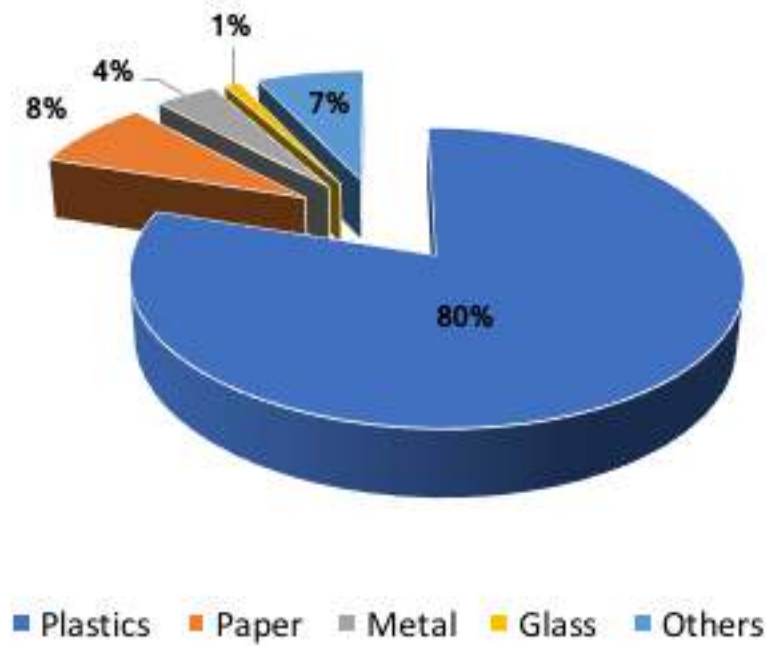


Figure 15: Small recycler in residential area [5]

According to figure 15, 80% of the company is recycling plastic waste, especially in Ho Chi Minh and Ha Noi city. Since the population density of Ho Chi Minh and Ha Noi is higher than other areas and the resident of 2 big cities emit huge plastic waste that has an excellent condition to collect the raw material for recycling.

The circumstance of plastic-made waste dispersing in the earth has been created many severe issues because of its long-range storage capability and challenging to decompose. Promote recycling plastic with technology that is advanced is a method of simply being "tested" in Nghe An and initially proved decisive, bringing double advantages to the plastic market and public welfare [33].

The newest case is creating plastic products and plastic beads from plastic waste at Ha Tien Investment and Development Joint Stock Company, centrally located in Dien Yen commune, Dien Chau district with a style separation line. Electronics worth approximately four billion VND supported 400 million VND from the national manufacturing marketing fund in 2017 [33].

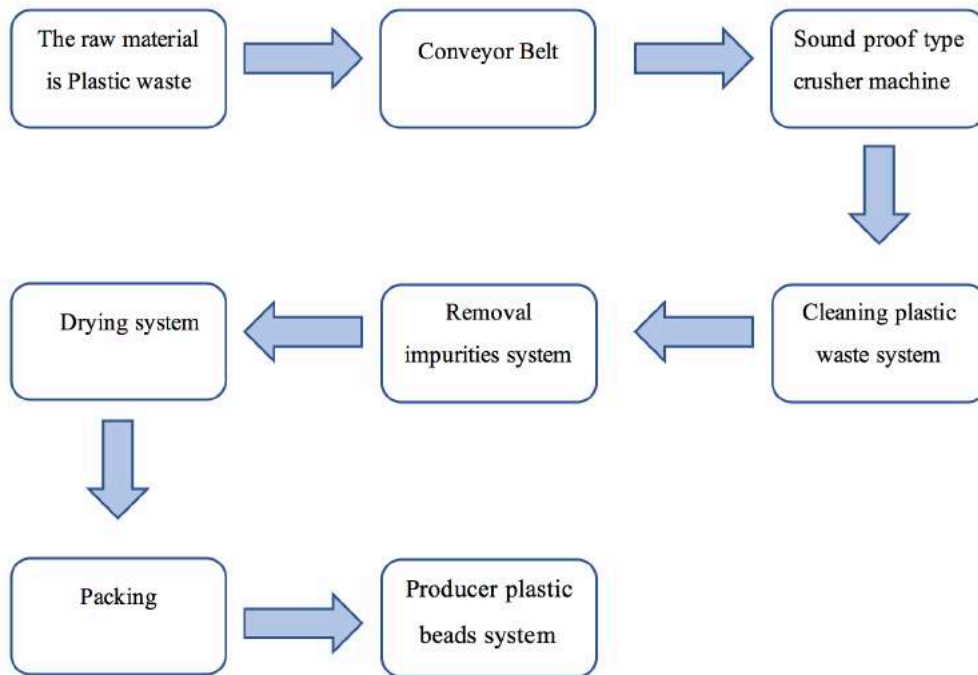


Figure 16: Recycling plastic waste by producer plastic beads in Viet Nam [33].

Plastic waste bottles of all sorts, instead of ending the "life cycle" by the dump, will now be "recycled," turning into a source of feedback for an eco-friendly and contemporary cycle. After becoming divided and sorting, squander plastic-made material is transferred to mincing computer by conveyor belt, undergoes shredding progression, and is placed into scrubbing clean computer by synchronous centrifuge to produce raw materials with the best purity [33].

Next, the content is cleaned again through the splitting phone system to get rid of harmful particles bodies before being placed into the extractor by a centrifugal portion of gear to ensure the dryness of 80-97 % [33]. Finally, the raw materials are essentially transferred to the grinder, friction dryer through the product packaging system to produce reused PET flakes exported to overseas markets [33].

Mr. Bui Tram - Deputy Director of the Department of Trade and Industry, emphasized: "This is actually the very first style in Nghe An supported by the Ministry of Trade and Industry, the nearby Department of Trade and Industry from this year 's national manufacturing marketing spending budget, with the drive to divide Share a part of financial backing, motivate as well as inspire the small business to increase dedication to develop models. Mr. Bui Tram hopes that this method will go on to be replicated in localities, growing production in the plastic market in specific and market generally, towards a future of sustainable growth, saving the planet, adding to the normal improvement of Nghe An " [33].

5.1.1.2 Benefits from the recycling plastic waste model.

First of all, this model has benefits for Viet Nam's economy.

According to Mr. Bui Tram - Deputy Director of the Department of Trade and Industry emphasized the modern structure will help the business save human resources, especially after applying mordent lines, they reduced approximately 50 physical labor for product quality assessment conserving production expenses. Not just that, much more contemporary lines help boost production from 3 tons/shift to 10 tons/shift, creating a healthy supply of products for export, improving sales for businesses [33].

Secondly, it has the advantage for the environment in Viet Nam.

Above all, the launch of technology advanced to make the most recycled clear plastic promises to take renewable values to Viet Nam. To begin with, turning waste into a helpful material can help lower the level of waste and save the land, which should be invested to bury chronic waste. Not just that, putting waste plastic material into a brand new "life cycle" also lowers the price of waste disposal while lowering their pollutant effect on land as well as water resources in the situation of landfill or even throw indiscriminately into the environment [33].

Additionally, through the compilation, the community's consciousness of waste separation at recycling and source of waste will be increased, together with the decrease of CO_2 emissions making the greenhouse effect because of savings, gain energy. This method also lowers the desire to exploit all natural resources, which are currently substantially forfeited when compensated from the programs recovered from the recycling activity [33].

However, the recycling of plastic waste in Vietnam has faced many problems about pollution, outdated technology, the economic and human factor. Furthermore, the recycling plastic made industry calls for relatively high technology, while businesses operating in this specific place are scattered and small, most enterprises.

Merely because a good deal of plastic-made waste is collected each day for recycling, compilation amenities may be unhygienic that may trigger water and soil pollution and harm plants and animals residing in rivers and lakes. When they fusion with rainwater, they create a toxic mixture called leachate.

Cleaning and treatment engineering plays a powerful feature in contamination amounts, health impacts (workers and the community) [45]. Most clear plastic material recycling facilities have

just a tiny area, making it difficult for the facility to develop creative and transform technologies that are vital in improving recycling efficiency, renewing growing creation and transforming technologies. It makes good sense for a small level generation but is a vital obstacle to recycling technology growth and growth development [46].

5.1.2 Using some green material to replace plastic bags in Vietnam.

In Viet Nam, some plants replace plastic, such as a banana leaf, fresh grass straws, dried grass straws, and rice flour straws. Vietnam is an agricultural country, so the application of these plants to replace plastic is a big step. The replacement of plastic to use banana leaves and fresh grass straws makes the environment more friendly, reducing the amount of plastic waste in daily life, besides creating jobs for people and contributing to the domestic economy. This process is a big step for the Vietnamese market as well as plastic waste disposal.

5.1.2.1 Using banana leaves to pack the vegetable.

Using banana leaves to pack fruits and vegetables keeps freshness more and helps customers increase the awareness of theirs of environmental protection, reduce the effect of nylon handbags, and the advantages of the town. Consumers prefer this strategy.

Significantly, the melon is loaded with two fruits. Banana leaves are meticulously cleaned to get rid of dirt, meticulously trimmed to fit the products and tied up with a rope.

Banana leaves pack vegetables, place into the supermarket, change the nylon bags that contain vegetables. Despite being an agricultural byproduct, the banana leaf is used to help the bundles of vegetables and fruits be wrapped clean, eye-catching, making consumers excited and very popular; fruits are kept fresh longer but also help consumers raise awareness of environmental protection, minimize the impact of nylon bags and towards the benefit of the community [47].



Figure 17: Packing a bundle of okra by banana leaf [48]



Figure 18: Packing a bunch of green onion by banana leaf [47]

5.1.2.2 Using fresh grass straws, dried grass straw, and rice flour straws to replace plastic straws.

According to the Ocean Conservation Association report in 2017, Vietnam is among the top 5 countries in the world that dump plastic waste into the sea. Hanoi and Ho Chi Minh city are two big cities to emit about 80 tons of plastic bags per day, reported by the Ministry of Natural Resources and Environment [49].

Plastic straws, similar to plastic bags, only be used for a few minutes and then discharged, and the environment takes decades to decompose.



Figure 19: Fresh grass straw wrapped by banana leaf [50]

New green lawn straw made out of the grass; a lawn with 1 or 2 years of age and shop room temperature (27-28 degrees) for five days, a department store in the fridge maybe two weeks. Besides, the length of straw is 18 cm with an internal diameter of 4.5 - 7mm, and thickness is 0.5 - 0.8 mm. The end of straws is cut with a sharp knife, and the internal velvet surface area is clean [50].



Figure 20: Dried glass straw [50]

Dried glass straw was made by 100% organic grass, absolutely no chemicals; sterilized with devices, hygiene, brilliance for well-being, and the planet. Concerning style, lawn straw has a thin, thin design like a lawn straw but is more vital. Also, grass straws are not as rough and heavy as those made of glass or metal. The cost of grass straw is affordable because the material supply is not too limited. The end of straws is cut with a sharp knife, and the internal velvet surface area is clean [50].



Figure 21: Rice flour straw using once time [51]

This particular kind of suction tube is totally and may be saved in a typical environment for approximately eighteen months, stay in cold water and regular water for approximately thirty minutes to two hours. Along with white from tapioca and rice flour, straws have various other colors such as green amaranth leaf extract; purple, black is made from black sesame and beets. Because it's made of natural substances, straws are edible. Straws made out of rice starch, disposable, can be consumed. Products made in Vietnam, secure and eco-friendly, could replace plastic straws [51].

The natural straws have a guaranteed shelf life of 12-15 weeks, which leaves much time for reuse and use before the natural straws have to be disposed of; even when the natural straws disposed of, they are entirely biodegradable and even advantageous to the atmosphere because the plant material enriches the dirt as it decomposes very quickly. Admittedly, all-natural straws cost far more than inexpensive plastic straws, though the writer believes it is ironic when we grumble about having to invest 2 cents for a straw when we are glad to invest five dollars or perhaps ten dollars on a beverage. Even paper, PLA, or maybe some other substitutes for plastic-made straws can have high hidden ecological and environmental costs in the long haul. Paper straws are unreasonably getting well known just since they are affordable enough. However, drinks are likely to taste bad when sipped through newspaper straws [52].

5.1.3 Applying recycling bottle model of Finland “Pantti” to Vietnam

The writer saw that Finland has one of the famous countries to protect the environment in the world; this country has many plants, using green material to replace the plastic bag. Significantly, one of the famous method to recycling the plastic waste this is the process of recycling bottle which called by “Pantti”. The writer thinks that this method can be applied in Vietnam because Vietnam needs a modern recycling method and bottles in Vietnam.

5.1.3.1 How the recycling bottle” Pantti” work

The recycling bottle means that a deposit-based return process for beverage packages makes it possible for the compelling compilation of packages for recycling. A beverage box tax of EUR 0.51 per liter is collected for the packages of specific alcoholic beverages and soft drinks, but turning a part of an approved and operational return structure or perhaps organizing a brand-new return system offers an exemption from the tax. The Finnish Government has given a decree on the recycling goals of return methods and the least values of various beverage package deposits. In training, most importers and beverage manufacturers are members of return methods handled by Suomen Palautuspakkaus Oy, hereinafter Palpa [53].

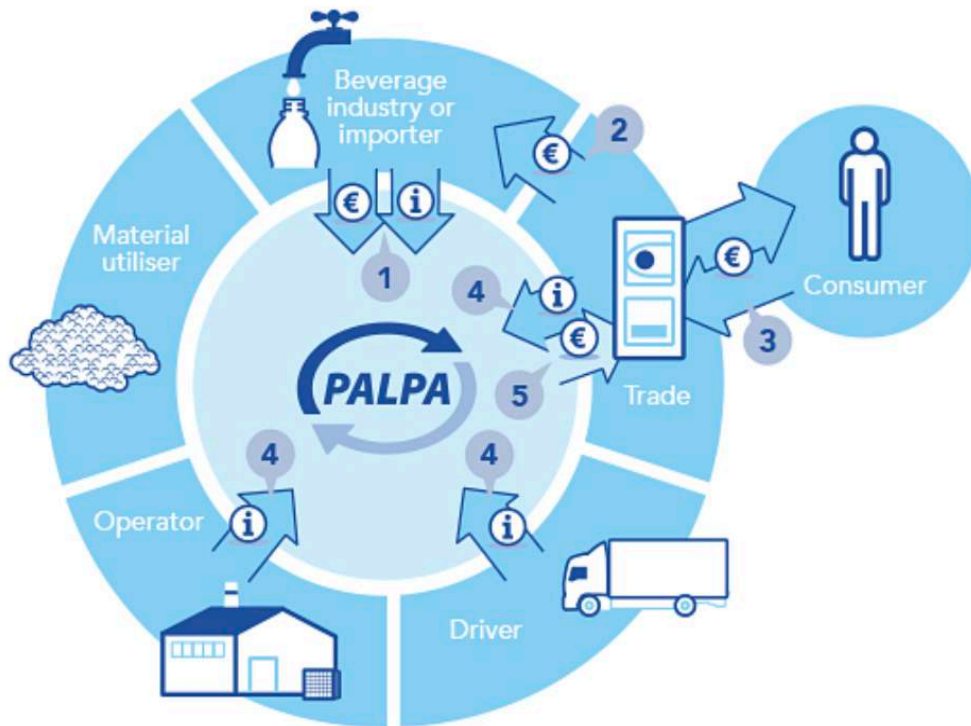


Figure 22: Circulating deposit [53]

PALPA is the company that manages the return devices of beverage packages. The duties of the collection are included by the administrator, recycling, and/or reuse of the packages belonging to the systems of theirs. Additionally, Palpa manages the administration of the build-up in their return methods, improving the systems of theirs and the communications regarding the operations of theirs [53].

There are five steps for circulating deposits by PALPA. The first step is that the maker, or perhaps importer of the drinks, pays PALPA the deposit for the item delivered for sales. The second step is the maker, or maybe importer of the beverage, provides the item for sales in a store that pays the deposit to the producer or perhaps importer of the drinks in the cost of the service. The third step is to pays the deposit when purchasing the item and get it back when going back the empty bundle to a returning point. The next step is the return point and the processing plant article the returned packages to PALPA. The final step is PALPA pays the build-up to the return points by the amount of reported returned packages [54].

5.1.3.2 Flow of products



Figure 23: Flow of products [53]

According to figure 23, the author shows six steps of processing the flow of products. The first step is the maker, or perhaps importer of the beverage, provides the item for sales in a shop. The second step is that the customer purchases the item and returns it drain to the return point. The third step is that the car owner picks up the returned unoccupied packages from the return point. The fourth step is the driver provides the packages to the processing plant. The next step is that the content is presented from the processing plant to the preprocessor. The final step is that most recycling supplies from beverage packages go back using new beverage packages and other products [53].

5.1.3.3 Other fees and compensation of “Pantti”



Figure 24: Other fees and compensations [53]

According to figure 24, the writer shows that the other fees and compensations are illustrated through figure 24. There are five steps of this process. The first step is PALPA pays to handle charges to the return points taking packages from consumers. The second step is PALPA pays transport compensations to the drivers. The third step is PALPA pays the expenses of the processing of drinks packages in processing plants. The fourth step is that the preprocessor pays the cost of the content to PALPA. The final step is that the expenses of the device are actually covered by the charges paid by importers or manufacturers of beverages [53].

5.1.3.4 The positives of a deposit based return system.

By becoming users of Palpa's return methods, importers and beverage manufacturers are exempted from the drinks packaging tax. The build-up of consumers is encouraged by the packages to go back empty drinks packages for recycling [53].

Like the nearest return point and the performance of the reverse vending machines, some other areas influence their will to recycle. Attitudes and habits also affect: In Finland, returning plastic bottles and cans is learned in youth, and it is regarded as crucial. Thus, the recycling fees of drinks packages in Finland are among the very best on the planet. When the supplies of beverage packages are effectively recycled, we can save natural resources and keep the planet

cleaner. The recycling supplies acquired from PET clear plastic bottles and glass bottles are utilized to manufacture other products and new bottles in numerous different sectors of business [53].

5.1.3.5 Benefits when Vietnam applying the recycling bottle of Finland

In Vietnam, they collected the plastic bottled by handicraft; after that, the labor will sell it for the company. It takes many times to collect the plastic bottle in Vietnam. If they used the recycling bottle of Finland, they would save the time, money, and motivation for Vietnamese people to save the bottle and exchange the bottle to get the money. Besides that, this method helps the child get a good habit and attitudes to protect the environment and raise children's awareness. Moreover, the recycling plastic company does not need to rent many laborers who collect the plastic on the street or families since the plastic waste is gathered in one place through "Pantti" method, especially this method makes the street greener and cleaner.

Furthermore, this method attractive the investor to join the green revolution by recycling a plastic bottle or recycling plastic waste because this is a new area in Vietnam and Vietnam have to the modern method to solve the environment population especially plastic waste in 2 big cities: Ho Chi Minh City and Ha Noi City. If Vietnam applies this method to our daily life, it could better help the economy and the environment.

However, the writer knows that it is hard to apply to Vietnam since the investment cost for recycling plastic is not enough to install or develop the recycling bottle in this country. However, if they apply it, the writer thinks this is a good signal for the environment in Vietnam.

5.1.4 Present State of Regulation and Policy connected to Plastic Recycling in Vietnam.

Overall, the federal government of Vietnam has been highly assertive at creating environmental regulations and mitigating plastic-made waste pollution. Nevertheless, the usefulness of checking and enforcement of environmental regulation is typically weaker. A summary of the present legislative groundwork and its implications on the plastics recycling business is summarized in this chapter.

5.1.4.1 Environmental Regulation as well as Implications for the Plastics Recycling Industry.

First, Policies on waste management in Vietnam began with the Law on Environmental Protection 1993, which acronym "LEP" has regulated the basic provisions on environmental

protection and waste management. Vietnam has created and emphasized the 3Rs principle and concepts into the Law on Environmental Protection 2005. With this law, for the first period, squander segregation at source of energy, reuse, and recycling was controlled in information, and the idea of EPR was created. In 2009, the National Strategy on Integrated Solid Waste Management to 2025 was used with a vision to 2050. The method has defined clear directions for waste management, establishes goals and solutions, and tasks to get the targets [55].

After China's import ban on the clear plastic waste product, there have been efforts to export even more clear plastic waste product quantities to Vietnam. Nevertheless, these quantities can neither be technically or organizationally managed, which is the reason it is currently only permitted to import precisely labeled and high-quality waste. Remarkably, this includes the latest basis of an organization that must ultimately turn into the PRO of the EPR process to control and organize the system. Nevertheless, the practical implementation could just be guaranteed under the premise that the present mismanagement and lack of specialized know-how are overcome. Additionally, they also usually name the high levels of crisis as a hindrance. Chile may be used as a good example and might serve as a role model, that may serve as a role model [55].

Second, in November 2010, the National Assembly of Viet Nam surpassed the Environmental Protection Tax Law (with 98.7 percent of the votes), which entered into pressure on one January 2012. For drafting the law, the Ministry of Finance consulted the German GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH) for specialized advice. The brand-new law taxes a range of eco damaging activities and substances. The environment Protection Tax is an indirect tax applied to the generation and importation of particular products, which includes oil products, and estimated as an absolute quantity on the amount of the items [56].

According to Vo Tuan Nhan, who is Deputy Minister of Environment along with Natural Resources said that the highest tax rates for a single-use plastic bag are 50,000 VND (around 2 dollars) per kilo well as “that is not enough” [57]. No material implications on speed of plastic recycling or perhaps behavior change towards plastic-made use. Pundits cite that the tax on makers for creating single-use plastics is very tiny to have some impact and the ministry estimated that every Vietnamese family consumes 5 to 7 clear plastic bags each day because plastic bags are not merely handy but cheap [57].

Third, the Prime Minister's decisions regulation for taking again and therapy of discarded plastic thought by National Strategy on Integrated Solid Waste Management to 2025, vision to 2050 [58].

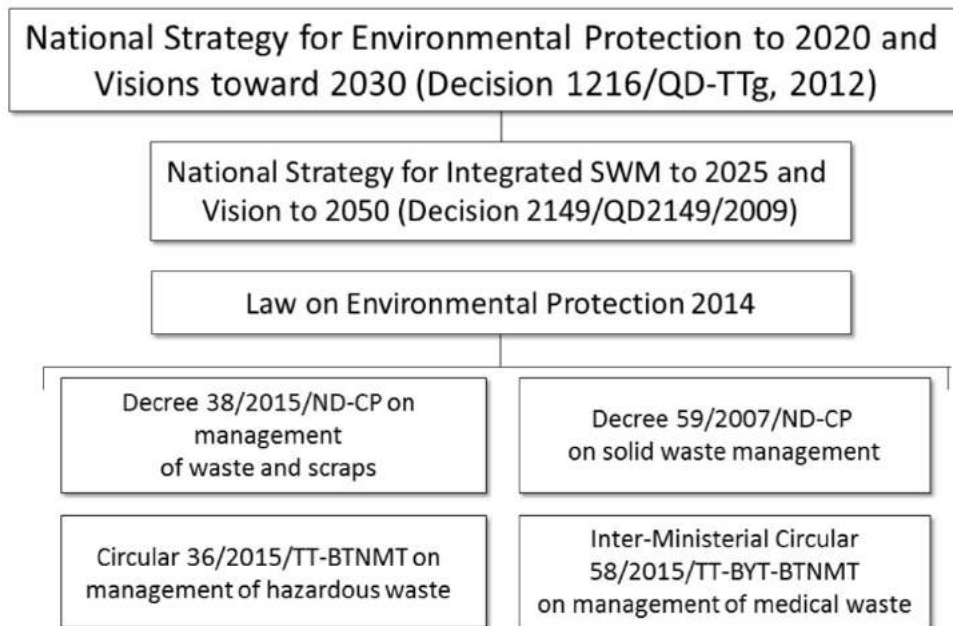


Figure 25: Major Trends of 3R Policy Implementation in Vietnam [58]

Vietnam has some achievement by applying this policy:

- Significant reduction in the amount of municipal solid waste produced by instituting policies, projects, and programmers at local and national amounts, encouraging each creator and customer to bring down the waste through greening generation, greening sustainable consumption, and lifestyle [58].
- Develop proper category and inventory of dangerous waste to ensure reasonable control of hazardous waste [58].
- Promote full-scale usage of agricultural biomass trash and livestock waste through reuse and recycle steps as adequate to attain a selection of co-benefits like GHG emission reduction, power security, alternative livelihoods in outlying as poverty reduction, among others [58].
- Progressive implementation of "extended producer duty (EPR)" by motivating creators, retailers, and importers along with other related stakeholders to fulfill the responsibilities of theirs for collecting, recycling, and disposal of entirely new and emerging squander streams, particularly e-waste [58].
- Maximize co-benefits from waste management technologies for local air, water, oceans, and global climate and soil pollution change [58].

Fourth, according to Nguyen Xuan Phuc (Prime Minister in Vietnam), promulgate two directive numbers. There are directive number 27/CT-TTG and directive number 2227/VPCP-KTTH [59]. The directive number 27/CT-TTG is halted granting new or perhaps renewed certificates for entrusted entities in importing scrap, and the others have stipulated a ban on importing plastic-made scrap by 2024 [60]. Just before the issuance of these laws, Vietnam accepts plastics scrap with HS code 3915. Nevertheless, as a response to China's ban on clear plastic imports (which redirected a considerable amount of worldwide plastic-made scrap into Vietnam), the Federal Government has reviewed the policies on imports of plastic-made scrap to mitigate the environmental threat. As a result, these policies suggest that the plastics recycling business will count on domestic energy sources of plastics scrap, especially after 2024 when the total ban is actually in place [26].

Fifth, the Vietnam Green Label Program (VGLP) was established to manage the eco-labeling system through the decision 253/QD BTNMT of the Minister of Natural Resources Environment dated March 5th, 2009. The Vietnam Green Label Program is handled by the regular ISO 14024 (Type I environmental labeling - Procedures and principles) of the International Organization of Standardization (ISO). The Vietnam Green Label Program's goals are improving and keeping the quality of the earth by reducing materials and energy usage and wastes produced in the manufacturing procedure, consumption, and trading of services and products. In order to attain effectiveness of environmental protection tasks, the ability is evaluated by the Vietnam Green Label Program to manage and control the environmental impacts of every kind of service and product based on "Comprehensive comment of the item lifecycle". Accordingly, for each kind of product team, the environmental advantages will likely be evaluated for the entire lifecycle, from the phases of raw materials extraction, trading, production, and usage to the point of disposal. Moreover, the main objective of the VGLP improves the sustainable use of natural energy and environmental protection through advertising consumption and production of eco-friendly products, which are evaluated and accredited by the Government. VGLP aims to create and post criteria for 14 product groups, including biodegradable plastic shopping bags [61].

Finally, according to Dr. Nguyen Trung Thang (member of Drafting Committee of State of the 3Rs in Asia and the Pacific), defined guidance for waste management, objectives, solutions, and tasks to get targets by the National Strategy on Integrated Solid Waste Management to 2025, perspective to 2050 policy. The national program stipulates a recycling rate of municipal

waste of 85% to 2020, along with 90% to 2025. Nevertheless, interviews cite a shortage of enforcement, checking, and data collection inhibiting a highly effective implementation of the policy [62]. The advantages of 3Rs and environmentally sound waste management in Viet Nam until today have been that understanding of incorporated solid waste management, 3Rs, and circular economy had been created and understood by policymakers, environmental management folks at the local and national level. Understanding the benefits and advantages of 3Rs will develop a foundation for marketing this particular idea down the road [62].

5.1.4.2 Economic Policies as well as Implications for the Plastics Recycling Industry.

While there is a level alignment that is high of economic policies to boost resource effectiveness, there is no organized push in unlocking the market potential of the recycled plastics current market. Interviews on the earth also indicate a relative lack of understanding of available investment/subsidy applications favorable towards plastics recyclers [26].

According to the Government law with decision No.2992/QD-BCT was published 17, June 2011. The law approved the plastic business development program for 2020 with a vision to 2025 by the Ministry of Industry and Trade [63]. There is a program for boosting the use of waste material ratio in sectoral understanding plans: The plastic-made industry is designed to deal with plastic waste to components to boost the ratio of domestic substances [26].

Secondly, decision No. 3892/QD BCT is given on 28 September 2016 by the Minister of Industry and Trade approving of a master plan for manufacturing development in the Red River Delta by 2025 with the perception toward 2030 [26]. Clear goals of this strategy are set for the clear plastic generation (pipes, other products, and packages) in Hai Phong, Hung Yen, Hanoi, Bac Ninh, and Hai Duong biodegradable as well as reusable plastic container production is encouraged [26].

Third, Vietnam Environmental Protection Fund was started to increase capital from individuals and organizations inside and outside the nation, to get the money invested by the State to help tasks, activities, projects, and programs in environmental defense on a national scale. Economic development has been set out to link generation with environmental safety that is a crucial necessity for companies. Nevertheless, it is not denied that production, technological innovation, and investment with environmental safety methods do not have minimal capital. Thus, companies are very concerned about how companies can attain financing with a reasonable interest rate to create these solutions. The capital of Vietnam Environmental

Protection Fund is just one of such funds. Thus, on 26 February 2002, the Prime Minister issued Decision No. 82/2002/QĐ TTG to set the Vietnam Environmental Protection Fund (VEPF) under the Ministry of Science, Environment and Technology with a charter capital of 200 billion VND. The Vietnam Environmental Protection Fund was proven to aid related agencies and investors in implementing Vietnam's environmental safety plans. VEPF Fund has become a reliable entity, a helpful tool of capital for buy-in environmental protection in Vietnam. Investment in environmental protection will take the advantages of the brand, and bring financial advantages to companies [64]. Offers financial assistance to enterprises interested in the transparent plastic recycling sector by proposing easy to low-interest rates (2.6 - 3.6 % per year) loans with the highest lending speed of 70 % of the total project investment [26].

Finally, the Municipal Waste Recycling Fund of Ho Chi Minh City started in 2006 to offer loans and investigate managing, recycling, and reusing misuse. Under the Fund, an application was implemented by HCMC to help plastic-made recycling, which includes spurring international cooperation in recycling (e.g., software of Chinese gear for recycling squander PET plastic bottles into products) [26].

5.1.5 Raise awareness and interact with across stakeholders.

Promote education and propaganda to increase consciousness about the dangerous effects of plastic bags and plastic waste on social, economic, human health, and environment; creating efficient remedies to minimize consumption, increase reuse; recycle plastic-made waste to the community as individuals. Trade centers, markets, supermarkets, and enterprises use eco-friendly substitutes, gradually cutting back on to probably the lowest amounts, restricting disposable plastic items and being hard to decompose; plan the generation of things to upgrade disposable plastic products with eco-friendly products that ensure legal, technical, and quality provisions. The expansion in this particular environmental issue additionally causes educators to perceive practical environmental training as a solid reaction to fight against the environmental crisis [65]. Environmental education provides pupils with opportunities to connect with complex environmental problems and create good attitudes, expertise, and inspiration to take environmental action [66, 67]. Steg and Vlek highlighted that the quality of the planet is dependent clearly on human behavior patterns [68]. The norm activation theory points out the pro-environmental conduct as being brought on by a chain reaction involving three variables, namely negative consequence (i.e., understanding of oneself), ascribed task (i.e., feeling of personal norm and responsibility) (i.e., moral obligation to do and refrain from a particular behavior), to potential environmental effects in this instance [69]. Thus, pro-

environmental behavior for the present study is recognized as human behavior that deliberately seeks to lessen the harmful environmental impact of one's steps on the natural atmosphere (e.g., plastic-made reduction, raising awareness as education) [65].



Figure 26: Soldiers and people participated in collecting garbage and plastic waste at Do Son beach (Hai Phong city) in response to the campaign "Make the world cleaner 2019" [70].

According to the Ministry of Natural Resources and Environment, the event "Anti-plastic waste" in 2018 was launched with the participation of ministries, branches, socio-political organizations, the commitment, and international organizations of company associations, supermarkets, and trade centers to minimize plastic bags and plastic products - for disposable use. The event is designed to call on all levels, sectors, each citizen, and socio-political organizations, with practical actions to modify behavior, patterns of using clear plastic bags, and continual plastic products, utilized once and for all. Around this occasion, representatives of leaders of ministries, branches, and departments; socio-political organizations; associations, creation; swap enterprises using transparent plastic materials, retail enterprises and goods distribution; Representatives of international businesses, embassies have signed commitments to take part in the motion "Anti-plastic waste" [71].

Thua Thien Hue launched some campaigns to protect the environment; one of the famous campaigns is "Sunday Green", "Say no with the plastic waste which using one time", "Pick up

a piece of trash to make Hue cleaner”. These campaigns are approved by Prime Minister Nguyen Xuan Phuc and widely disseminated in provinces in 2019 [72].



Figure 27: Sunday Green of Thua Thien Hue [72].

5.2 THE STRATEGIES OF PLASTIC WASTE DISPOSAL IN OCEAN.

With a coastline of over 3260 km, Vietnam runs along with the land measurements, with dozens of estuaries moving into the ocean [73]. Plastic waste is genuinely a severe issue in Vietnam. In the beaches where trash is constantly collected, plastic-made still floats a great deal in the ocean. In a few seaside areas like mangrove forests, mudflats in which trash is not collected, plastic-made debris forms a heavy coating on bottom mud, addressing branches and roots, causing significant damage to the environment. As outlined by some investigation results, Vietnam is one of the top 5 nations on the planet, with the estimated amount of clear plastic waste discharged into the ocean from 0.28 to 0.73 million tons/year [73]. Plastic waste is genuinely a severe issue in Vietnam.

According to IGES, which is based on the data and information of Country Chapter, the State of 3Rs in Asia and Pacific shows no official stats on coastal plastics waste and marine in Viet Nam at current. Simultaneously, there has not been much progress and effort to control waste in the coastal environment and the marine, particularly for plastics. In 2010, the Law on

Environmental Tax imposed taxation on bags that are plastic. There is also a system on command of waste from plastic-made bags issued by the Decision 582/QĐ TTG in 2013. The National Assembly used a Law on Marine and Islands Environment and Resources Natural in 2014. The Law has a chapter outlining laws on pollution control, oil spill reactions, and sea dumping. As outlined by the Law, discharged energy sources are needed to be controlled, with all waste materials efficiently addressed to supply environmental criteria before being discharged into the ocean, instructing that almost all floating trash must be collected and viewed suitably. Nevertheless, plastic waste was not explicitly used in the regulations [58].

Vietnam considers the great improvement of marine environmental safety; economic climate accompanied with marine environmental safety and does not exchange the planet for unsustainable and hot growth. In specific cities and grade one cities, 90% of supermarkets and industrial centers used eco-friendly plastic bags to switch difficult-to-decompose plastic bags [73]. Nevertheless, in grade two or even lower urban areas, the number of commercial centers accounts and supermarkets for a reduced proportion, the usage of continual plastic bags is still reasonably common. Enterprises also wish to create environmentally helpful clear plastic bags to replace difficult-to-biodegradable clear plastic bags for customers steadily. Companies have implemented pollution avoidance as well as management methods based on environmental protection regulations. They have printed labels and product codes so that customers can recognize the kinds of eco-friendly plastic bags that are recyclable (thickness; 30 micrometers) or maybe biodegradable plastic bags. After five years of implementation, the land has 43 plastic bag products of 38 recognized enterprises that are eco-friendly [73].

Besides, some countries in Europe created huge floating devices to collect plastic waste and cleaning up the plastic waste in the ocean. Boyan Slat, the designer of the Ocean Cleanup task, tweeted that the 600 meter-long (2,000ft) free-floating boom had shot and retained debris from what is referred to as the Great Pacific Garbage Patch [74].

The operating principle of floating device showing the picture below.

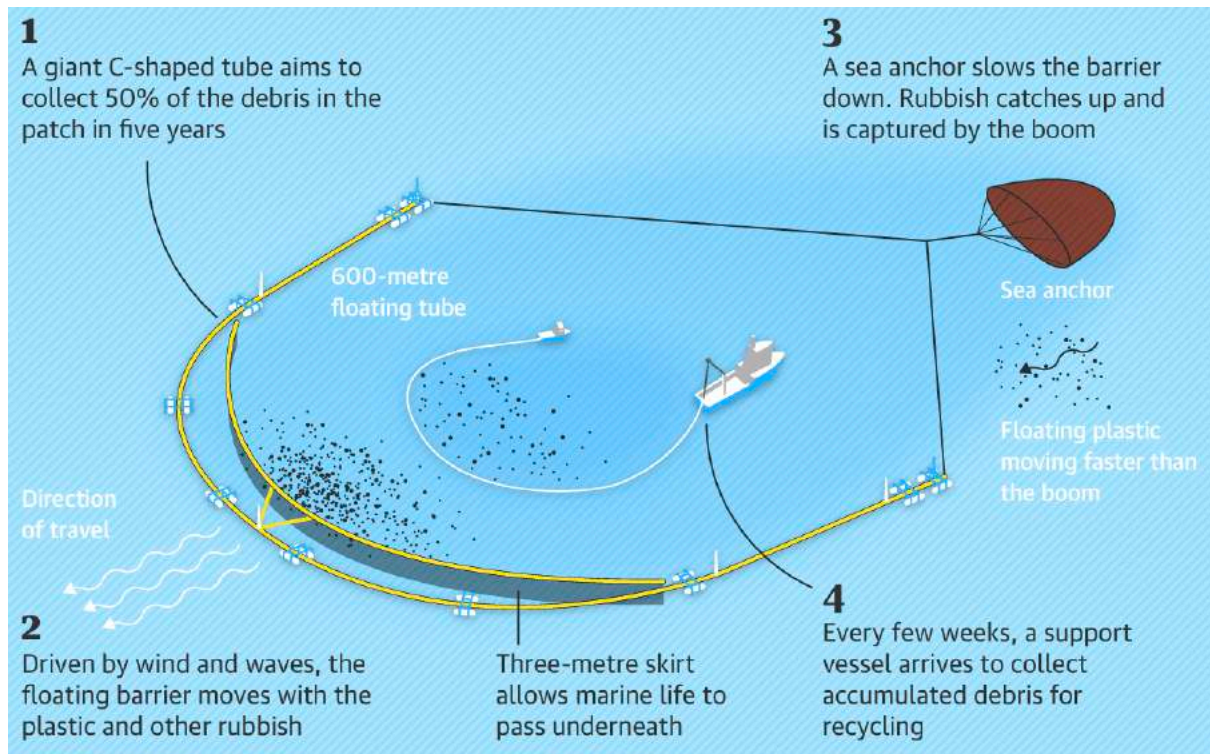


Figure 28: The project aims to collect plastic debris from the Great Pacific Garbage Patch [74]

The vast cleaning process was created to not merely collect disposed fishing nets and big noticeable plastic objects, but additionally micro-plastics. The transparent plastic barrier floating on the ocean's surface area has a three-meter-deep (10ft) display below it, which is meant to trap several of the 1.8tn pieces of plastic material without annoying the marine life below [74].

This method can be applying to the coastline of Vietnam, especially in Vung Tau, Nha Trang, Da Nang.

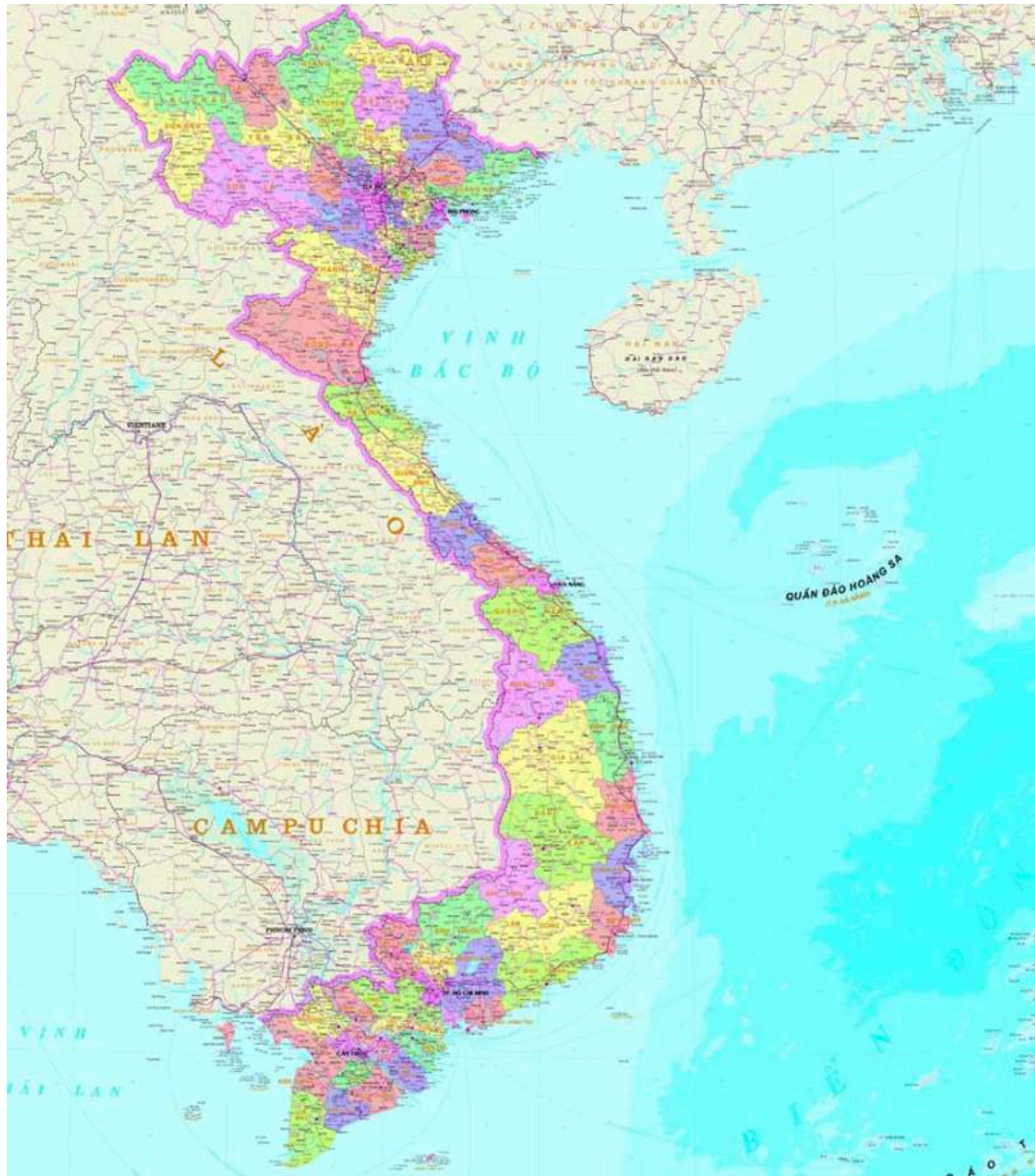


Figure 29: Vietnam Map [75]

From figure 29, this method can be applying to the coastline of Vietnam, especially in Vung Tau, Nha Trang, Da Nang. This method helps people who collected the plastic waste in the ocean quickly and makes the plastic waste and trash concentrated in one place. People easier to collect and deliver to the specific place to disposal.

5.3 PLASTIC WASTE MANAGEMENT IN VIETNAM

Presently, roughly 85% of the waste created in Vietnam is becoming buried without any treatment on landfill websites, 90% of which are unhygienic and pollute the earth. The vast majority of the know-how providers are really from the USA, European countries, China, and Singapore. Nevertheless, the adoption of devices in the land is lower, and focusing on hardware strategies. Many wastes to energy systems are currently being urged by the federal authorities to use the waste and create valuable resources for different use [76].

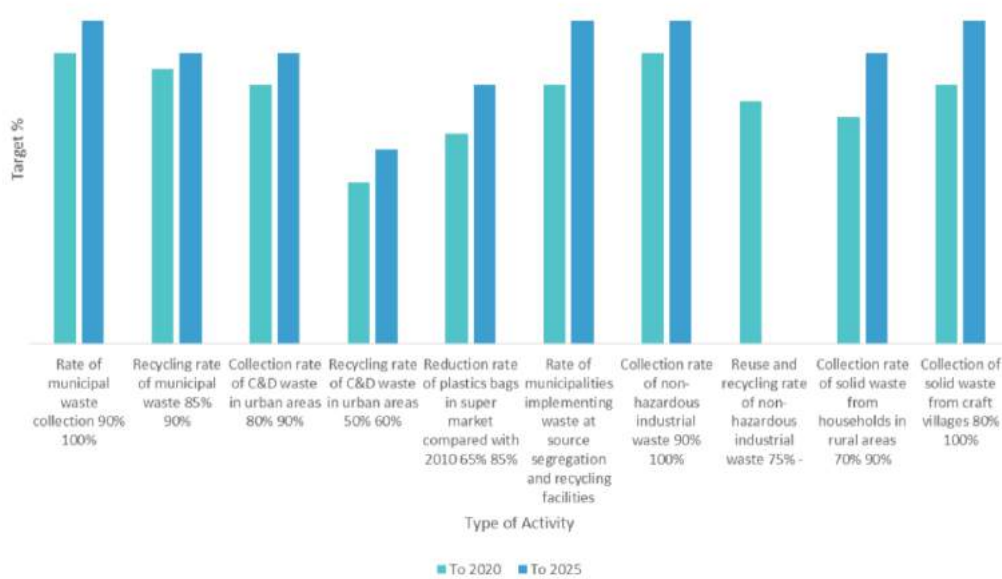


Figure 30:3R and waste management related targets in National Strategy of Integrated Solid Waste Management to 2025, vision to 2050 [76]

The local Department of Natural Resources and Environment will manage and supervise the implementation of laws and regulations related to plastic recycling through the plastic recycling association. The Plastic Recycling Association coordinates the recycling of waste, collecting waste recycling fees from the manufacturer. The recycling unit receives money from the association to recycle waste and reports recycling activities to the association.

Besides that, there is no official, constant, and scientifically-based information about the recycling rate of any type of waste at the national level released by the federal government in Viet Nam. Nevertheless, according to the MONRE report in 2011, the recycling rate of MSW will be around 8-12 % by volume. This recycling action is implemented primarily by the informal sector in craft villages [38, 58].

Based on JICA research in 2011, reusable waste like plastics, paper, and metal accounts for 8.2 % of the complete collected squander [58]. Misuse scavengers typically collect these recyclables, moved them to recycle craft villages, and 90% of them are converted into plastics, newspapers, and metallic items, while 10% get waste after recycling [38].

Moreover, the plastic waste management of Vietnam thought the policies and strategies to replace or reduce using the plastic used one time and supported the recycling company to reduce the plastic waste in Viet Nam. Especially, Educating children in protecting the environment as a young child will be one of the campaigns throughout the coming years and raising the awareness of people to the environment.

6. Discussion

According to the previous chapter, the results indicate that plastic waste management in Viet Nam is not easy. There are many limitations as the absence of infrastructures, absence of understanding, economic viabilities. Especially, recycling plastic is a big challenge in Viet Nam since Viet Nam lacks modern technology and plastic waste recycling. Besides, With Vietnam's quick industrialization as well as urbanization, the output of Vietnam's risky solid waste has improved, which needs to be successfully managed shortcomings which are connected with the leachate from improperly built as well as managed landfills; solid waste management is actually among the best authorities' goals in Vietnam. Moreover, increasing public awareness and knowledge of the environmental problem is a top priority in Viet Nam. Policies and strategies of plastic waste recycling in Viet Nam are unclear and lacking the experience and expertise in this area, investing in equipment and technology for plastic waste recycling is so important in Viet Nam to reach the goal of reducing 30% - 40% plastic waste in the environment [58]. These results build on existing evidence of applying the plastic waste strategies of Vietnam as an effective thought report of MONRE in 2011. However, the government should impulse the citizen to realize the strategies, especially plastic waste recycling. Besides, this study indicates two recommendations: firstly, this is recycling bottle "Pantti" of Finland into Vietnam to collect the raw plastic waste used in producer plastic beads in Vietnam. Secondly, using the vast floating device to collect the plastic waste and cleaning up the plastic waste in the ocean. The secondary data limit the generalizability of the results because some data is not public on the internet, and the data does not show the percentage of recycling plastic waste. The writer hard to find the effectiveness of each polices as well as the detail applying each strategy. Besides, the government does not have a detailed long-term strategy for plastic waste and a plan to raise the citizen awareness.

7. CONCLUSION

To fulfill the visionary approach where conflicts are enormous, it needs a set of strategies and plans. Difficulties linked with the end of life, consumption, and production of plastic can be transformed into a fantastic opportunity and raise the competitiveness of industries in Viet Nam. The current situation in Vietnam has implemented many measures to handle plastic waste, from using the model to recycle plastic waste into plastic beads; and policies to support waste treatment businesses in Vietnam to help businesses be eligible to grow. In addition, the impact of plastic education on the environment has been applied to children and Vietnamese people, in general, to help people realize the importance of the environment. Moreover, Viet Nam applied other materials such as banana leaves to pack vegetables instead of plastic, fresh grass straws, rice straws, which also brought high efficiency while seeking to create jobs for people while bringing back to the economical source for Vietnam.

However, there are still some big problems with recycling, and waste disposal in Vietnam, such as investment, equipment, models, technology is still rudimentary human consciousness. Although this thesis has to study better insight into the strategy for plastic waste, some notable inadequacy is considered. The author saw that the result of the strategy is not clear, and it is hard to find detailed data for applying the strategy. Moreover, there is vast information about the plastic waste strategy, confusing and complicated to filter the report and paper.

In summary, this research aimed to identify plastic waste strategies in Vietnam. Based on collected secondary data of Vietnam Plastic Association and the Ministry of Natural Resources and Environment in Vietnam, it can be concluded that the strategies of plastic waste disposals are effective, and the plastic areas in Vietnam are essential for the economy and environment. The result indicates that potential plastic waste disposal industrial is significant in the present and the future.

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