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Lesson for Vietnam from developed countries in Asia in solid waste segregation, collection, and transportation policies

Dissertation submitted by Pham Thi Ngoc Tram

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ELECTRONIC SIGNATURE

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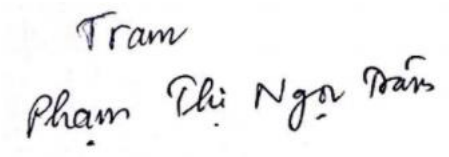

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Abstract

Solid waste management, including solid waste management practices (technology, infrastructure, and finance), is a severe issue in low-income and developing countries (Navarro, 2019). In these countries, 90% of the waste is often disposed of in landfills or treatment plants and burned openly without supplemental facilities (World Bank, 2019). The implementation of a proper solid waste sorting, collection, and transportation is one of the effective methods to tackle this issue. However, solid waste segregation, collection, and transportation are overshadowed in most literature regarding solid waste management. That is why the author would like to look at these first phases in the solid waste management process. The author also chose Vietnam as a case study and applied the theory of transfer developed by Dolowitz to test the policy models in two developed countries in Asia, South Korea, and Japan, then to figure out policies on solid waste segregation, collection, and transportation that could be used to address this issue in Vietnam. Finally, the findings suggest some policy recommendations for policymakers, especially competent authorities governing solid waste management regulations in Vietnam.

List of Abbreviations

EC	European Commission
EU	European Union
OECD	Organization for Economic Co-operation and Development
GDP	Gross Domestic Product
JICA	Japan International Cooperation Agency
MOC	Ministry of Construction
MOE	Ministry of Education
MONRE	Ministry of Natural Resources and Environment
RCRA	Resource Conservation and Recovery Act
UNEP	United Nations Environment Program
VBWF	Volume Based Waste Fee

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Chapter 1: Introduction

According to the World Bank's statistics, about 2.01 billion tons of solid waste was generated in all the cities globally in 2016, which means that each person produced 0.74 kilograms of waste per day. They also estimated that by 2030, the world would generate about 3.40 billion tons, approximately 1.5 times compared with the amount of waste in 2016 (World Bank, 2019). With a massive amount of solid waste being generated, the quantity of which is expected to increase every year, a feasible and effective solid waste management policy governed by the government in each country is vital for achieving sustainable development goals. Having said this, effectively and efficiently managing solid waste remains a severe issue for underdeveloped and developing countries.

Having developed its industrial base and witnessing an economic boom, Vietnam has become highly urbanized in the last four decades since Doi Moi.[1] Along with the development of the overall economy, there has been a significant increase in the volume of waste generated, especially solid waste. Many factors have contributed to this rise in waste generation, including population and industrial growth, urbanization, increase in demand and consumption, to name a few. In the report published by the Vietnamese Ministry of Natural Resources and Environment (MONRE) in 2019, urban areas generated approximately 35,600 tons of solid waste every day, while this number in rural areas was around 28,300 tons. The total amount of solid waste produced in Vietnam in 2019 increased by 46% compared to 2010, and most of the waste has not been well-disposed (Bao Chinh phu, 2020). It is expected that by 2030, Vietnam will produce about 54 million tons of solid waste WWF, 2020), three times higher compared with the amount of solid waste generated in 2019. The significant increase in waste every year has put significant pressure on the Vietnamese solid waste management infrastructure (related to waste segregation, collection, transportation, and disposal). Landfills and open dumps are favored waste treatment methods in Vietnam, and many of them are overloaded owing to the rapidly increasing amount of waste.

Therefore, implementing sustainable waste management, especially solid waste management, to combat the increase in solid waste generation has become one of the Vietnamese Government's top priorities in recent years. The National Strategy on Solid Waste Management to 2025, with a

[1] Doi Moi is a comprehensive reform program that encompasses the economy and many other aspects of social life initiated by the Communist Party of Vietnam in the 1980s. Congress Party of Vietnam VI, 1986.

vision to 2050, which was promulgated in 2018, is the most current, comprehensive, and ambitious legal framework in Vietnam regarding this issue. The prime goal of the Vietnamese Government when developing and implementing this framework is to achieve sustainable development in the upcoming future. This goal could be specified into four subsidiary ones, including (i) preventing, controlling, and substantially limiting the increase in the waste generation, (ii) minimizing environmental pollution caused by waste, (iii) protecting human health and the environment, and (iv) responding to climate change (Bao Chinh phu, 2020). According to the evaluation of World Bank, Vietnam has a sound legal and policy framework on solid waste management; however, owing to a lot of challenges that the country is facing, such as the lack of financial resources and human capacity, modern technology, the coordination between the central and municipal agencies, the Government's attention to energy generation from waste, etc., the current waste management system in Vietnam fails to meet the objectives of the Government. Besides, there is a big gap between the initial expectations of the Government and the reality.

In this Thesis, the author wants to focus more on three first steps in the waste management process, **waste segregation, waste collection, and waste transportation** as these steps are essential for an effective solid waste management method. A practical and effective solid waste segregation at the source means more waste could be reused and recycled. Less waste goes to the open dumping or landfill or waste treatment system, resulting in energy saving. Proper waste collection and waste transportation protect the environment and human health. Currently, Vietnam does not have either adequate segregation of waste methods or proper waste collection and transportation.

On the other hand, to the best of the author's knowledge, there is a lack of studies working on these steps only; most of the studies analyze solid waste management as a whole and mainly focus on the situations without providing concrete policy recommendations. Many studies only focus on the waste management issue in specific regions/cities, mainly in big cities such as Hanoi, Ho Chi Minh City, or Hai Phong. Besides, barely any studies explore the potential of well-implemented and adequate waste segregation, waste collection, and transportation models in developed countries in Asia.

Therefore, this Thesis, hopefully, can give recommendations that could improve Vietnamese solid waste policies (in terms of waste segregation, waste collection, and waste transportation) to shorten the gaps. Accordingly, the prime objectives are to have a clear idea of the Vietnamese

Government's policy and implementation of these phases of solid waste management, point out the current challenges that the country is facing, and propose several policy recommendations to the Government of Vietnam to increase the rate of solid waste sorting and recycling, minimize the amount of solid waste generated and increase the efficiency of solid waste treatment. To do that, the author will employ the theory of transfer developed by Dolowitz with eight questions to draw the lessons applicable to Vietnam from South Korea and Japan's solid waste management policies.

The Thesis follows this structure: Chapter 2 reviews the literature on solid waste, solid waste management, focusing more on solid waste segregation, collection, and transportation in general and in Vietnam. Chapter 3 provides the theoretical framework. Chapter 4 presents the Research Design, in which the author will elucidate the methodology, case selection, and some limitations of the study. Chapter 5 examines the current situation, policy framework, and challenges in solid waste segregation, collection, and transportation in Vietnam. Chapter 6 then summarizes the main points of the models chosen and tests them. Based on the test, some meaningful findings could be applied to the current Vietnamese context. And finally, in Chapter 7, the author will give some policy recommendations for the Vietnamese policymakers to overcome the existing gaps and challenges.

Chapter 2: Literature review

This chapter reviews the literature on solid waste, solid waste segregation, solid waste collection and transportation, and the studies conducted in the context of solid waste segregation, collection, and transportation in Vietnam. First, the chapter looks at the academic discussion on solid waste and the concept of solid waste segregation, collection, and transportation. The discussion then focuses on analyzing the studies on solid waste management in Vietnam and the performance of the competent authorities on this issue. So far, there has been a lack of research to study solid waste segregation, collection, and transportation in Vietnam and how it facilitates and hampers a proper and effective solid waste management process.

General overview about solid waste, solid waste segregation, collection, and transportation

Solid waste and solid waste categorization

Scholars, researchers, and Governments (through legal documents) develop their definitions of solid waste. According to the Resource Conservation and Recovery Act (RCRA),[2] solid waste is "any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, resulting from industrial, commercial, mining, and agricultural operations, and community activities" (USEPA). Beranek stated that solid waste combines many types of waste, resulting from multiple human activities such as agricultural or industrial ones (Beranek, 1992). Solid waste is not either liquid or gas, and it is something animal or human does not want, as defined by Jess W. Everett in his paper about solid waste disposal (Jess, 2012). Under Decree 38/2015/ND-CP issued by the Government of Vietnam, solid waste is waste in the solid form generated from production, business, service, household activities, etc.[3] The Center for Sustainable Systems at the University of Michigan also provides a definition of solid waste (commonly called "garbage" or "trash"), which refers it as "common household waste, as well as office and retail waste," excluding "industrial, hazardous, and construction waste." (University of Michigan, 2020). According to the Organization for Economic Co-operation and Development (OECD), solid waste is useless, has low liquid content, and people do not want it (OECD, 1997). This definition is similar to the definition regulated in the Ketchikan Municipal

[2] Resource Conversation and Recovery Act is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste.

[3] Decree 38/2015/NĐ-CP, http://vbpl.vn/botainguyen/Pages/vbpq-van-ban-goc.aspx?ItemID=63061

Code. Solid waste is unwanted or useless material, and it does not contain enough liquid to be classified as liquid waste (Ketchikan Municipal Code). In short, solid waste is discarded and unwanted from human and animal activities, and it also covers almost the amount of waste generated by all the activities.

The categorization of solid waste varies and depends much on solid waste management policies and regulations in the countries (Hussein, 2018). The Department of Environmental Conservation, New York City, divides solid wastes into eight types, household hazardous waste, asbestos, construction and demolition waste, commercial/industrial waste, hazardous waste lamps, medical waste, used electronic waste, used oil, and waste tires (Department of Environmental Conservation). Surprisingly, according to the Department of Environmental Conservation, household waste is not included as one type of solid waste. The Ketchikan Municipal Code even classified solid waste in a more complicated way, with fourteen kinds of waste, besides other common types of waste such as household waste, industrial/commercial waste, construction/demolition waste, tires; it includes more types of waste such as yard waste,[4] wood waste, "earth material including dirt, rocks, and soil-free of organic material" (Ketchikan Municipal Code). According to OECD, unlike the Center for Sustainable Systems, the University of Michigan, which excludes industrial, hazardous waste from solid waste, solid waste consists of municipal waste, industrial and commercial waste, waste from "agricultural and animal husbandry" industries, demolition, and mining services (OECD, 1997). However, these are the main/popular types of solid waste: household waste, commercial/industrial waste, construction and demolition waste, agricultural and animal waste, and electronic waste.

The Thesis mainly focuses on residential, commercial, institutional, and municipal services. This is because other processes that produce solid wastes such as construction and demolition, industrial/commercial, process, and agriculture ones need a designated and complicated waste treatment system which, due to the limited scope, the author could not present and elucidate these treatments in detail. Accordingly, residential waste comprises mainly "food wastes, paper, cardboard, plastics, textiles, leather, metals, special wastes (batteries, oil, tires, etc.), and household

[4] "Yard waste" means waste resulting from maintenance or removal of vegetation, including, but not limited to: brush, branches, leaves, flowers, grass, shrubs and small trees. Yard waste shall not include animal excrement, rocks, garbage, solid waste other than yard waste, demolition debris, moderate risk waste, biomedical waste, dangerous waste, or extremely hazardous waste.

hazardous waste" (World Bank, 1999). Stores, hotels, restaurants, markets, and office buildings are the primary commercial waste producers, which generate "paper, cardboard, plastic, wood, food waste, glass, metal, special and hazardous waste" (World Bank, 1999). Institutional waste has the same type of waste as commercial ones, but different producers, including schools, hospitals, prisons, government agencies. Finally, municipal services comprise waste from activities such as "street cleaning, landscaping, parks, beaches, other recreational areas, water, and wastewater treatment plants" (World Bank, 1999).

Solid waste segregation, collection, and transportation

Multiple papers focus on solid waste management worldwide, generally, and in developing countries particularly. Scholars have different perspectives on solid waste management; however, the most researched area in the solid waste management literature has been solid waste disposal and treatment. They categorized waste management into "landfill, incineration, recycling and composting" (Halkos, 2016) while landfill, incineration, recycling, or composting are only one step in the solid waste management process. Most scholars or researchers are more inclined to emphasize the importance of solid waste treatment such as landfills, incineration, etc., than other phases (Omran, 2008; Ngoc, 2009; Curea, 2010). Therefore, solid waste segregation, collection, and transportation are somehow overshadowed in most of the literature regarding solid waste management.

According to Gallardo, waste segregation at the source and waste collection are the initial phases of the waste management system (Gallardo et al., 2011). Tchobanoglous et al. and Demirbas also defined solid waste management as collecting, transporting, processing, recycling, or disposing and monitoring solid waste products (Tchobanoglous et al., 1993; Demirbas, 2011). Guitta and Jihad are among the few scholars highlighting the importance of these phases as proper solid waste segregation, collection, and transportation systems heavily affect the "quality and quantity of recycled material" (Sabiini et al., 2019). Recycling is proved as one of the pivotal elements of proper and effective solid waste management as it transforms solid waste into valuable materials and resources, contributing to sustainable development (Vining et al., 1992; Dijkers, 2019; Jekria, 2016; Zaman, 2010). Furthermore, appropriate waste classification, collection, and transportation reduce waste treatment costs significantly and simplify the solid waste treatment process (Wen,

2014). Therefore, solid waste sorting, collection, and transportation play essential roles in a sustainable and effective waste management process.

Many countries govern the solid waste sorting method by providing a waste sorting definition, defining types of solid waste, and guiding the categorization of the solid waste. In Germany, since January 2015, waste segregation is compulsory; accordingly, the inhabitants must sort waste into these types, including biodegradables, paper, plastic, glass, and metal (Bundesamt, 2015). All these types of waste are collected separately at the households or institutions. An advanced detector system sorts the solid waste collected again automatically before being transported to waste treatment facilities or recycling stations to ensure the high quality of recycled materials and the high resource recovery rate (UNEP). India also defines waste sorting as the "separation and storage of individual constituents of waste material" (CPHEEO). The Government also specified the objective of waste sorting and types of waste sorting such as primary sorting at source, at the landfill, secondary and tertiary sorting (CPHEEO). However, like many other developing countries, waste sorting is not compulsory in India, and "household waste sorting is a complex activity" (CPHEEO) as it involves many sectors in India. The French Government also requests the solid waste holders or generators to sort solid waste at the source or put the solid waste into separated bins such as paper, metals, plastic, and glass. For organic waste, the national plan is that by 2025, "every household shall have access to separation at source of bio-waste either through composting close to homes or separate collection" (EU). These regulations aim to involve the population in solid waste segregation (EU). In general, solid waste sorting is regulated in environmental acts in many countries; however, it is commonly not compulsory and more like volunteer activities and is also based on public awareness.

The definition and method of solid waste collection and transportation are barely mentioned in research or papers. Like solid waste segregation, they are primarily included in the regulations on the environment or waste management in countries. For example, the EU, in its Directive 2008/98/EC defines waste collection as waste gathering, "including the preliminary sorting and storage of waste for transport to a waste treatment facility" (European Parliament, 2008). The Ketchikan Municipal Code does not state what solid waste collection and transportation are. However, it defines how to collect and transport solid waste and who bears the responsibilities to collect and transport waste (The Ketchikan Municipal Code). The OCED also introduces a definition of solid waste collection and transportation as the way solid waste is collected and

transported to the treatment facilities, discharged by private companies, municipal services, or specialized enterprises (OECD, 1997).

In fact, there are many studies conducted on solid waste mismanagement issues, and pursuing sustainable waste management becomes a top priority of many countries as waste mismanagement is the leading cause of catastrophic social and environmental consequences (Working Group of Environmental Auditing, 2010; Navarro, 2019). To the best of the author's knowledge, in many papers, the authors referred to efficient solid waste segregation on the spot as one of the critical ways to combat solid waste issues (Henry et. al., 2006; Chen et. al., 2010; Tai et. al., 2011; Rajamanikam et. al., 2014). However, in these papers, the authors only proposed that recommendation without elucidating further what the government should do to achieve that. Another existing problem is in these studies is that the authors/scholars offer policy recommendations without suggesting a better collection and transportation system, especially in developing countries.

Studies in Vietnam

First of all, most of the studies on waste management in Vietnam are dated. Some of them were conducted nearly 20 years ago, such as the Report by World Bank in collaboration with the Waste-Econ Project (under the Canadian International Development Agency) in 2004, Nguyen T.Y with her study on a waste-reuse program in 2004, or research by Abdelnaser Omran and Maria Agvrilescu in 2007.

Secondly, limited papers are published on solid waste management in developing countries or Asia, in which the authors included Vietnam as an example in a chapter; and presented the situation of Vietnam. Even when there are papers about solid waste management in Vietnam, they only assessed the situations and gave solutions options/scenarios for some selected cities (big ones). For example, another report by the World Bank with the MONRE and MOC's support focused solely on three cities: Hanoi, Hai Phong, and Phu Tho (World Bank, 2018). In the paper published by the Asian Productivity Organization, in the chapter on Vietnam, the authors only mentioned four big cities/provinces, including Hanoi, Hai Phong, Hai Duong, and Quang Ninh. Another paper by R.L. Verma, G. Borongan, and M. Memon in 2016 analyzed the solid waste management status of Ho Chi Minh City. A recent article published in 2019 by Nguyen Huu Hoang and Csaba Fogarassy also studied the best solid waste management system that could be applied in Hanoi. This becomes

a common point when foreign and Vietnamese researchers study solid waste management in Vietnam. They often focus more on analyzing the waste management situation and giving policy recommendations in a specific region/city instead of the national level. Usually, the researchers pay more attention to big cities/provinces such as Hanoi, Ho Chi Minh City, Hai Phong, or Da Nang, instead of small cities or mountainous areas because it is easier to collect data and information from big cities. However, big cities, normally, have better solid waste management system, compared to small cities/provinces. Small cities/provinces should have received more attentions from researchers so that they could seek out and approach more effective solutions to tackle the solid waste management issue.

Thirdly, most of the papers mentioned above, whether they analyzed the whole situation of Vietnam or some selected cities, they barely mentioned the status as well as the issues of solid waste segregation, collection, and transportation in Vietnam by that time, that is why there is such a few policy recommendations regarding these phases were proposed. Most of the policy recommendations are related to "the regulation and economic policies, institutions framework and arrangements, technologies and infrastructure, capacity building, the participation of stakeholders, and financing mechanism" (Verma, 2015; World Bank, 2004; Hoang and Csaba, 2020). Therefore, this Thesis will address the issue mentioned above by covering a more extensive range of territory and offering more comprehensive solutions regarding solid waste segregation, collection, and transportation to the Vietnamese Government.

Chapter 3: Theoretical framework

This chapter will provide the theoretical framework that will be used as the foundation for the study. The purpose is to test whether the theory of policy transfer by Dolowitz could be applied in the current situation of Vietnam. According to Dolowitz (2003), "policy transfer is the process by which the policies and practices of one political system are fed into and utilized in the policy-making own political system" (Dolowitz, 2003). The policy transfer, in general, is an intentional process of learning from the policy at an institutional setting or place A to use a copy or derivative of the policy at an institutional setting or place B. In this case, the prime goal of this Thesis is to propose policy recommendations regarding the solid waste segregation, collection, and transportation based on international experiences, specifically the policies implemented in South Korea and Japan, to support the Vietnamese Government to achieve its sustainability goals. Therefore, the author believes that this theory, together with its policy transfer framework developed by Dolowitz and Marsh (2000), could help the author test the models in South Korea and Japan, and come up with a conclusion.

To make it happen, the author will follow a set of eight questions in the Dolowitz and Marsh model to analyze and assess the models in the Vietnam context.

(i) Why do actors engage in this policy transfer? (This question is to specify the motivation of political actors when engaging in the policy transfer process: voluntary, coercive or mixture)[5]

(ii) Who is involved in the policy transfer process? (Nine main categories of political actors: elected officials, political parties, bureaucrats/civil servants, pressure groups, policy entrepreneurs and experts, transnational corporations, think tanks, supra-national governmental and non-governmental institutions, and consultants, identified by Dolowitz and Marsh) (Dolowitz and Marsh, 2000)

(iii) What is transferred? (Eight categories: policy goals, policy content, policy instruments, policy programs, institutions, ideologies, ideas and attitudes and negative lessons, identified by Dolowitz and Marsh) (Dolowitz and Marsh, 2000)

(iv) From where are lessons drawn? (Two types: Cross-National or Within a Nation)

[5] Ibid

(v) What is the type of transfer? (This question is to help the author analyze which degree of transfer should be applied in the Vietnam context. There are four degrees of policy transfer, including "Emulation -transfer of the ideas behind the policy or program, Copying – direct and complete transfer, Combination – Mixtures of several different policies, and Inspiration – policy in another jurisdiction may inspire") (Dolowitz and Marsh, 2000)

(vi) What restricts/facilitates the transfer?

(vii) How is the process of policy transfer related to policy success or policy failure? (This question is to detect some factors leading to the failure/success of the policy transfer. Three factors suggested by Dolowitz and Marsh which could lead to policy failure, including "uninformed transfer" (the policymakers have insufficient information about the policy and its implementation in the originating country), "incomplete transfer" (main factors leading to the success of the policy are not transferred), and "inappropriate transfer" (the policymakers do not pay enough attention to the difference between the borrowing and the originating system).

Chapter 4: Research Design

This chapter outlines the research design of the Thesis. It first presents the methodology used in the Thesis. It then specifies the reasons for the case study selection and ends up with the study's limitations.

Methodology

The specific analytical methods used are as follows: archival and discourse-analytical methods.

First, the author uses the archival research methods, in which related books, journals, and reports will be utilized to build the sections of literature review and theoretical framework, ranging from existing literature on solid waste management in developed and developing countries and Vietnam. This method is the easiest to identify the research gap.

Second, regarding the discourse-analytical method, the author analyzed the discourses of developed and developing countries, with a focus on Vietnam. Official documents and speeches from Vietnamese leaders and officials in general and the competent authorities that mainly take charge of solid waste management (MONRE and MOC) are the centers of this approach. This method is the most important one as political speech, and official documents are the most accurate sources to evaluate and analyze waste management policies. Furthermore, it is convincing evidence to measure the government's expectations-results gap. Some of the policy documents are reviewed, such as the Decision No.807/QD-TTg approving the target programs of thermal treatment for facilities causing severe environmental issues in the period from 2016 to 2020, the National Strategy on Solid Waste Management to 2025, with a vision to 2050, the Decree 38/2015/NĐ-CP on waste and discarded materials management, Law on Environmental Protection 2014 and Draft Amended and Supplemented Law on Environmental Protection 2020, Resolution 41/NQ of the Politburo on environmental protection in the period of industrialization and modernization and Resolution No. 09/NQ-CP of the Government on the regular meeting of the Government in January 2019.

Case selection

As for the case study analysis, the author chooses Vietnam as it is an interesting case. As mentioned above, to the best of the author's knowledge, there has been a lack of papers working on solid waste management in Vietnam at the national level recently in general and solid waste segregation,

collection, and transportation, in particular. The author has lived in Vietnam for more than twenty years and has observed how the Government has been managing solid wastes for years. This allows the author to understand more about Vietnam's solid waste management system, especially how solid waste is sorted, collected, and transported. The Government of Vietnam puts a lot of pressure on the competent authorities to handle this issue for years; however, the situation has not improved. Most solid waste produced in Vietnam is not sorted and collected properly, and mostly ends up in either open dumps or landfills instead of being recycled or reused. Not surprisingly, Vietnam is still among the top four countries that produce the most plastic waste globally, with about 1.8 million tons per year (Quoc hoi, 2019), according to a World Bank report. For the time being, the Government of Vietnam is drafting and receiving public comments for the revised Law on Environmental Protection. One of the top priorities of this Draft Revised Law is to address and overcome all the challenges causing solid waste mismanagement in Vietnam. Hopefully, this paper could give the Government of Vietnam some feasible policy recommendations regarding the three initial phases of this process.

The author acknowledged that the developed countries had reached the current level of advancement through evolution for decades as growth from low-income to middle- and high-income levels. Accordingly, their solid waste management situations also evolve. It is such a challenge for developing countries like Vietnam to apply the developed countries' solid waste management system to its practice due to the discrepancies in resources, development needs, and situations. However, the developing countries could draw lessons from the methods or the steps that the developed countries have implemented and help them achieve positive results in the solid waste management system. That is why the author decided to choose two developed countries, including South Korea and Japan as the models to test whether Vietnam could learn any lessons and apply some of the policies on segregation, collection, and transportation system from these two countries. Several decades ago, these two countries also faced the same problems and challenges that developing countries are coping with for the time being. They experienced a waste crisis due to the increase in economic growth, which resulted in skyrocketing consumption, leading to the rise in solid waste generation. However, they have solved them, and currently, these countries have developed a sound and effective solid waste management and become the models for the developing countries in Asia to draw lessons from (World Bank, 2014; Whiting, 2019). Therefore, reviewing and examining the methods and the policies they have applied to tackle the issue is

meaningful for developing countries like Vietnam to fashion its policies related to solid waste management.

Limitations of the study

The author's initial plan is to conduct interviews with the Vietnamese government officials or experts who directly involved in the policy planning, decision-making process, and implementation of the solid waste management policies, and also the staff working for the urban environmental companies in urban areas and cooperatives in charge of solid waste collection and transportation in rural areas. However, due to the COVID-19, it is challenging to set up/arrange the interviews in person. The difference in time zone between Vietnam and Spain also limited the author to conduct online discussions with government officials and other people. Therefore, the author has to rely much on the content analysis from legal documents, articles, and studies on solid waste management, which is unbiased but not provides a holistic picture and the nuances of the current situation in Vietnam.

Chapter 5: Current situation in Vietnam

5.1. Solid waste generation

Vietnam is one of the fastest-growing economies in Southeast Asia as well as in the world. This is reflected in the economic statistics of Vietnam in the last ten years (2009 - 2019), in which the gross domestic product (GDP) reached about 266 billion USD. The economic growth rate in 2019 was 7.02%, the highest level from 2009 to 2019 (General Statistics Office. (2020). In 2020, despite being buffeted by COVID-19, it was among three countries (together with China and Myanmar) (General Statistics Office, 2020), recording a positive economic growth rate (2.91%) (Reuters, 2020). The process of rapid economic growth and urbanization with the growing number of manufacturing and trading industries, industrial zones, and urban services, on the one hand, has created millions of jobs for workers. However, it has also put more pressure on the environment by increasing the amount of solid waste generated.

As mentioned above, the average amount of solid waste in urban areas in 2019 per day was approximately 35,600 tons and 28,300 tons in rural areas. The amount of solid waste generated in localities depends on the size of the population, the urbanization, and the industrialization rate of localities. The localities with the volume of solid waste generated over 1,000 tons per day, accounting for 25% of total solid waste in Vietnam (of which Hanoi and Ho Chi Minh City generated over 6,000 tons/day) (MONRE, 2019). The amount of solid waste generated in the top five biggest cities in Vietnam (including Hanoi, Ho Chi Minh City, Da Nang, Hai Phong, and Can Tho) accounted for 40% of the total solid waste nationwide (MONRE, 2019). There has been an increase in solid waste generated in the highly urbanized and middle urbanized localities in recent years. At the same time, in low-urbanized and small cities, this rate is relatively low.

5.2. Solid waste segregation

Currently, Vietnam has no regulations on environmental protection, that request the residents/households to categorize solid waste. This is why the rate of solid waste segregation in Vietnam is meager. It also leads to the fact that it is difficult to track the rate of solid waste segregation nationwide. There has been no database on the exact rate of waste sorting published annually by the Vietnamese Government to the author's best knowledge. The Summary Report by the United Nations Environment Program (UNEP) published in 2017 also did not give an exact number of the source segregation in ASEAN countries but an approximate one instead.

Accordingly, the rate of source waste sorting in Vietnam in 2017 was considered low or unsatisfactory (less than 50%) (UNEP, 2017).

Mostly, the solid waste is mixed, which causes many troubles for the waste treatment process. In addition, solid waste in Vietnam is dumped or discarded on the streets, canals, or vacant lots, negatively affecting the urban landscape. Furthermore, these places could act as breeding sites for rodents carrying disease agents, resulting in harmful impacts on human health.

Due to the rapid rise in the amount of solid waste generated in urban areas in recent years, some localities such as Ho Chi Minh City, Hanoi, Bac Ninh, Da Nang, Binh Duong, Lao Cai, Dong Nai have already launched and implemented some waste segregation programs at the source. These programs aim to categorize the recyclable waste and non-recyclable waste and reduce waste buried in the landfill and the open dumping. However, these programs have not produced the desired results as the infrastructure for waste collection and transportation and waste treatment was not consistent with the intention. Other than that, even the waste generators (households, restaurants, institutions, etc.) follow the guidelines of sorting waste; the wards do not have the facilities to store segregated waste separately. As a result, the collected waste, sadly, was mixed and dumped into trucks. The government officials also focused more on raising people's awareness about waste segregation instead of requesting the waste generators to follow all the guidelines on categorizing solid waste. Besides, it is difficult to change people's behavior quickly as they kept mixing waste. In addition, most people assume that it is the Government's responsibility to tackle the waste issue, including waste segregation, collection, transportation, and treatment.

In rural areas, households sort solid waste into three main types: (i) recyclables (paper, carton paper, metals) to sell to the waste collectors, (ii) biodegradables (as most households in rural areas in Vietnam have their gardens or raise cattle to improve their livelihoods, therefore, it is easier for them to handle food wastes), and (iii) other wastes (plastic, glass, etc.). However, the primary purpose of waste sorting is not due to the increased awareness about the impacts of waste on the environment or human health; instead, it aims to meet the requirements/standards of the "New Countryside Program."[6] Therefore, somehow, the waste sorting in rural areas is not highly efficient and asynchronous. Moreover, some households do not intend to categorize their household waste

[6] This program is an initiative by the Vietnamese government with the aim of boosting the rural economy as well as improving the quality of life in rural areas. A rural area has to meet five primary requirements as follows will be considered as "a new rural area".

or only sort waste if they receive the subsidiaries from the government agencies (MONRE, 2019). In these areas, there has been a dearth of awareness-raising programs or campaigns about waste segregation. The leadership in these areas also lacks competency and knowledge about how to sort waste properly and the benefits of this activity in the waste management process.

5.3. Solid waste collection and transportation

a) Solid waste collection and transportation in urban areas

According to the statistic synthesized by the Vietnam Ministry of Construction (MOC) and MONRE, there has been a steady increase in the rate of solid waste collection in urban areas, from 81% in 2010 to 92% in 2019 (MONRE, 2019). Compared to other countries in ASEAN, Vietnam ranked 3rd in the solid waste collection rate in 2017 (UNEP, 2017). According to the report of the MONRE in 2019, big cities have a high rate of waste collection and transportation, such as Ho Chi Minh City (100%), Da Nang (100%), Ha Noi (99%), Hai Phong (97%), and Can Tho (95,5%) (MONRE, 2019). However, the actual figure of solid waste collection and transportation in Vietnam generally and these cities particularly might be lower.

There are three prevailing methods in waste collection and transportation in the urban areas, which are operated mainly by the urban environment companies (URENCO, CITENCO, etc.) contracted out by the People's Committees. These state-owned companies are in charge of solid waste collection, transportation, and disposal in almost all provinces in Vietnam.

(i) Tricycles (carts): it is the most used system in urban areas in Vietnam due to the narrow streets. The workers push the tricycles designated to navigate the narrow roads through the residential areas to collect the waste bags daily. The collected waste is dumped into gathering sites before being loaded into trucks; then, solid waste is transported to the open dumping, landfills, or treatment designated plants.

(ii) Trucks: small trucks pass through the roadsides (when big enough) and collect the inhabitants' waste bags along the streets. After that, the trucks go to the transfer sites (if possible). The waste bags are loaded again into the larger trucks before being transported to the open dumping, landfills, or treatment designated plants.

(iii) Waste containers: The big trucks pass through the streets (when big enough) to collect the waste discarded into the waste bins along the roads. Besides, there are some designated/selected areas where the waste generators put their waste bags. The workers

collect and load them into the trucks before being transported to the open dumping, landfills, or treatment designated plants.

Indeed, these systems are not only out of date but also problematic.

(i) All of them are labor-intensive. For example, the second and third systems require at least four workers (drivers excluded) to collect and load the waste bags.

(ii) Traffic jam (especially the two latter systems). It happens when all the trucks gather at the same spot on the streets.

(iii) Environmental problems. These trucks and tricycles do not have wastewater sump tanks with an anti-spillage cover plate to prevent the leachate from leaking on the streets. In combination with the gasses, the bad odor from the leachate and noise from these trucks negatively affect people on the road and the urban landscape. In addition, unsanitary transfer stations also cause environmental problems. In those areas, there are not only the workers from the urban environment companies who collect, load, and transport the waste but also informal waste collectors/pickers who scatter, sort, and trade the waste materials. Their activities make the surrounding place dirty and smell bad, which adversely impacts the adjacent neighborhood.

b) Solid waste collection and transportation in rural areas

According to the statistics published by the MOC and MONRE, the rate of solid waste collection and transportation in 2019 was approximately 66%, which is much lower compared to the rate in urban areas (MONRE, 2019). In addition, there was a significant discrepancy among rural areas in localities. Some localities such as Hanoi, Ninh Thuan, or Dong Nai reached a high solid waste collection and transportation rate in rural areas, 88%, 85.8%, and 98.9% (MONRE, 2019). In comparison, some mountainous provinces had a limited figure, such as Hoa Binh (31%), Dak Lak (22.4%), Dien Bien (12%), and Lai Chau (11.7%) ((MONRE, 2019). While the state-owned urban environmental companies are in charge of the waste collection and transportation system in the urban areas, the waste collection and transportation in the rural areas depend much on the spontaneous cooperatives under the municipalities.

The prevailing system in the rural areas is to use small trucks/tricycles, and waste bags are put directly by the inhabitants to the tricycles or small trucks. Instead of daily collection, the waste collection in the rural areas occurs two-three times per week. Due to the lack of technology,

financial resources, and human resources, these areas do not have a good collection and transportation system. Even when the waste is collected and transported to the landfills and open dumps, most landfills and open dumps in rural areas are not sanitary and based on traditional practices, which do not meet the standards. Besides, most rural areas are less densely populated than urban areas, so some inhabitants prefer to dispose of their waste manually or discard the waste into the rivers or empty lots. In far-flung and remote areas, island communes, solid waste collection, and transportation are more challenging. In island communes, the collected waste must be transported to the mainland for disposal and treatment as most islands do not have standard landfills and open dumps. The fact that waste needs to be transported does not ensure economic and environmental efficiency (long-distance, high cost, potential risk of environmental pollution when transporting through the sea). It is also not feasible to invest in solid waste incinerators on the islands as the volume of generated solid waste is not large enough to ensure the prescribed capacity for the incinerators.

5.4. Solid waste segregation, collection, and transportation policies

According to UNEP and the World Bank's assessment, Vietnam has comprehensive policies and programs for solid waste management (UNEP, 2017; World Bank, 2018). The Law on Environmental Protection is the overarching law, which highlights the need for reducing, reusing, and recycling solid waste to achieve sustainable goals. For the time being, the Government of Vietnam is drafting and receiving public comments for the amended and supplemented Law on Environmental Protection. One of the top priorities of this Draft Law is to address and overcome all the challenges causing solid waste mismanagement in Vietnam. In addition, there are many circulars, decrees, decisions, and strategies governing the aspects of the solid waste management process: segregation, collection, and transportation, treatment.

a) Solid waste segregation legislation and regulation

Solid waste segregation is regulated in the Law on Environmental Protection and some other bylaws. Pursuant to Law on Environmental Protection 2014, solid waste generators (including but not limited to the owners of production, business and service establishments, institutions, agencies, households, and individuals) bear the responsibilities to sort solid waste at source to facilitate the waste reuse, recycle, energy recovery and treatment. Article 15, Decree 38/2015/ND-CP governs the categories of solid waste and the responsibilities of the municipalities in providing guidelines

on solid waste sorting and implementing the regulations. Accordingly, solid waste is segregated into three main types: (i) Biodegradables (food leftovers, leaves, vegetables, fruits, animal carcasses); (ii) Reusables and Recyclables (paper, plastic, metal, rubber, nylon, glass), and (iii) Others. In addition, the Government also set targets for waste sorting and recycling in the National Strategy on Integrated Solid Waste Management issued in 2009 as follows:

Table 1: Targets for the solid waste sorting and recycling

Target (%)	**2015**	**2020**	**2025**
Expected rate of the solid waste collection	85	90	100
Expected rate of the solid waste recycling	60	85	90
Plastic shopping bags	40	65	85
Segregation at the source of dry recyclables	50	80	100

Source: Decision No 2149/2009/QD-TTg issued on December 17, 2009

However, in 2018, the Government amended and revised the National Strategy 2009, including more specific targets applied to urban areas and rural areas. So far, the National Strategy on Solid Waste Management to 2025, with a vision to 2050, is the most recent one regulating the solid waste management process in Vietnam.

Table 2: Revised targets for the solid waste sorting and recycling

Target (%)	**2025**
Urban areas	
Expected rate of the solid waste sorting and recycling in the central and 1st-tier provinces/cities[7]	100
Expected rate of the solid waste sorting and recycling in other provinces/cities	85
Expected Rate of the Usage of environmental-friendly of plastic shopping bag in supermarkets or commercial/shopping centers	100

[7] The administrative system in Vietnam is divided in three tiers: 1st tier: provinces and state-run cities; 2nd tier: urban districts, rural districts, provincial cities, and towns; 3rd tier: communes, wards, and townships.

Rural areas	
Expected rate of the Solid waste sorting and recycling	80

Source: Decision No. 491/2018/QD-TTg issued on May 05, 2018

b) Solid waste collection and transportation legislation and regulation

Pursuant to the Law on Environmental Protection 2014, the municipalities have the right to assign the responsibilities of collection and transportation to the organizations or individuals who meet the legal requirements specified in the related documents. The organizations/individuals executing the waste collection and transportation sign a service contract with the municipalities. In Decree 38/2015/ND-CP, the Government already assigned the MOC to provide a sample service contract; however, until now, the MOC has not produced anything yet, except a draft circular providing guidelines on how to draft a service contract of solid waste collection, transportation, and treatment in 2016.

The Government specifies the solid waste collection and transportation requirements in Article 17 Decree 38/2015/ND-CP. Accordingly, the waste collectors and transporters have to collect solid waste based on the registered routes and transport it to the collecting points/transfer sites or solid waste treatment establishments (following the plan approved by the competent authorities). Proper waste bins or storage devices must be arranged on main streets, near the shopping malls, parks, residential blocks of buildings, institutions, and other public areas to ensure a daily solid waste collection and transportation system. In the process of transporting the solid waste, it is essential not to leak waste or leachate on the street, causing the emission of dust and bad odor.

Article 18 Decree 38/2015/ND-CP and Article 3 Decree 40/2019/ND-CP also govern the responsibilities of the solid waste collectors and transporters, in which they must (i) ensure sufficient workforce, means, and equipment dedicated to the solid waste collection and transportation in specified locations, (ii) collect and transport the solid waste to collecting points, transfer stations or treatment facilities using equipment meeting the technical requirements and management procedures as prescribed, (iii) ensure to collect solid waste in a highly hygienic and sanitary management method, (iv) be in charge of the solid waste spillage in the process of collection and transportation, which might cause adverse environmental impacts and (v) reporting annually on the solid waste collection and transportation as prescribed.

The collection and transportation fee for the solid waste collectors and transporters consists of the fee paid by households and the annual government subsidies. The Provincial People's Committee regulates the fee paid by households based on the local situation, living expenses, and solid waste generated. Therefore, there is a discrepancy among the fees in the provinces. These fees have excluded any amortization on investment as the Provincial People's Committee bears the responsibility to pay the amortization and the shortfall in the operation cost.

5.5. Vietnam's current solid waste mismanagement (in segregation, collection, and transportation)

In recent years, more households, especially younger people have acknowledged the benefits of waste sorting and started to categorize solid waste at source. Due to this, the solid waste collection and transportation have been improved. However, the competent authorities face many challenges in implementing a proper and effective solid waste segregation, collection, and transportation system. In this part, the author focuses on and elucidates some dominant causes of this solid waste mismanagement.

a) Institution:

- *Overlaps among the departments' responsibilities*: At the national level, several ministries such as the MOC, the MONRE, and the Ministry of Health (MOH) are involved in the solid waste management tasks. The MONRE oversees all the environmental issues, draft and shape the national environmental policies and regulations (MONRE, 2021). However, the prevailing authorities regarding solid waste management belong to the MOC, including formulating and developing the solid waste management policies and legislation; guiding the implementation of solid waste management policies and regulations; monitoring and supervising the solid waste facilities' construction plans; organizing activities promoting the investment and funding into solid waste management programs; etc. (MOC, 2021). From these tasks stated above, there are overlaps among these two ministries' responsibilities. This also results in a lack of accountability at the provincial level. In some provinces, the legal documents promulgated by these two departments might have some minor conflicts, and it is hard for inhabitants to comply with the regulations.

- *Ineffective cooperation among ministries, departments, and provincial leadership*: As mentioned above, there has been a dearth of statistics regarding the solid waste issues in Vietnam, especially the rate of waste segregation. Not many provinces have a database of their annual waste generation, waste collection, and transportation. Therefore, it is hard for the MOC or MONRE to synthesize and present an exact amount of waste generation or waste collection. Consequently, the annual report does not reflect well or provide a holistic picture of Vietnam's current situation.
- *Lack of highly qualified officers:* In many provincial departments of natural resources and environment as well as departments of construction, there are not sufficient highly skilled officers can monitor and carry out the enforcement of all the policies and regulations, issued not only by the central government but also the provincial people's committee. In rural areas, some staff working for the competent authorities do not have basic knowledge about solid waste management; therefore, they cannot convey the key points and ask the inhabitants to comply with the regulations (MONRE, 2019).

b) Regulations and policies

- *Lack of strict regulations:* Although the Government included the regulation requesting the waste generators to sort the solid waste into three types, the solid waste keeps being mixed in rural and urban areas. The Government also imposes administrative fines on illegal solid waste discard violations, ranging from 500,000 VND (~18€) to 7,000,000 VND (~257€).[8] However, this regulation does not produce the desired result as there is no official monitoring or supervision from the competent authorities. Regarding waste collection and waste transportation, the situation is not better. As stated above, the waste collectors and transporters are obliged to collect solid waste in a highly hygienic and sanitary management method and shoulder the responsibilities of cleaning the solid waste spillage in collection and transportation. Violations in these activities are also object to administrative fines (from 6,000,000 VND (~ 220€) to 10,000,000 VND (~367€).[9]

[8] Decree No.155/2016/ND-CP on administrative fines on the violations against regulations on environmental protection.
[9] Ibid.

On the one hand, these administrative fines are meager and do not cost the violators much. On the other hand, there is no regular examination from the competent authorities; these infractions keep happening in all provinces and cities in Vietnam.

c) Finance

- *The low fees paid by households and institutions:* The revenues for urban environmental companies comprise fees paid by the households and institutions, government subsidies, and other services. However, the fees paid by the households and the institutions are deficient compared with the actual cost for solid waste collection and transportation. The World Bank assessment in 2018 stated that "the average fee/month per household is less than 0.5%" (World Bank, 2018) while internationally, this fee should be 1-1.5% ((World Bank, 2018). According to the MOC, the fees paid by households and institutions only account for approximately 20% of the actual cost of solid waste collection and transportation (MONRE, 2019). Consequently, the remaining cost is subsidized by the Government. For example, in Hanoi, it cost URENCO around 600 billion VND (~22 million EUR) for solid waste collection and transportation ((MONRE, 2019). However, the revenue from the fees paid by households and institutions could only cover just a tiny part of the total cost, 30 billion VND (~1.1 million EUR) (5% of the total cost) (MONRE, 2019). Last but not least, according to the report published by the Center for Environment and Community Research, waste collectors and transporters do not arrange/form any groups of staff to segregate solid waste because of a lack of financial resources. This kind of activity is labor-intensive and requires many workforces, which cost a lot of money.
- *Difficulties in increasing private investment:* Private investors do not pay much attention to this sector due to its characteristics: low profit and high risk. In addition, this sector is heavily subsidized by the state budget; therefore, it is challenging to increase the privatization rate in this sector**.**

d) Technology and Infrastructure

- *Lack of modern equipment*: Even if the Government encourages inhabitants to sort solid waste at the source, it will not have any positive impacts if the collection and transportation systems are still the same. The Government requests the solid waste

generators to categorize the waste into three types; however, the tricycles/carts and the trucks do not have separated bins for each type. Therefore, it is useless to sort the solid waste at the source as it is mixed when being collected and transported to the transfer stations or treatment facilities. In addition, the current waste vehicles do not have wastewater sump tanks with an anti-spillage cover plate to prevent the leachate from leaking on the streets, causing displeasure and contamination to the public. In the public areas, only in some big cities such as Hanoi, Ho Chi Minh City, Da Nang, there are designated waste bins (one for recyclables and one for non-recyclables), but these bins are just in a pilot phase.

- *Lack of transfer sites*: Currently, in Vietnam, the transfer sites are only built and operated in Hanoi and Ho Chi Minh City due to the significant amount of waste generated in these two cities. Accordingly, Ho Chi Minh City has 40 transfer sites, while Hanoi is building one (Hanoi moi, 2021; Thuong hieu cong luan, 2021). This results in many challenges for solid waste collection and transportation. Usually, the waste treatment facilities are located far from the center, around 40-50 kilometers away. Because of no transfer stations, the whole process of solid waste collection and transportation is time-consuming, leading to high transportation costs and potential for spillages and contamination (Thuong hieu cong luan, 2021).

Chapter 6: Model test and main findings

This chapter presents South Korea and Japan model tests as well as the main findings from the tests.

South Korea and Japan's policies on solid waste segregation, collection, and transportation

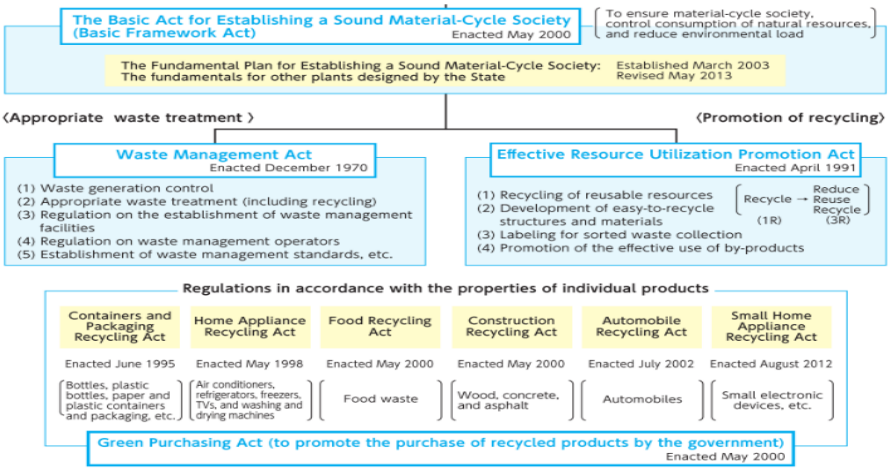
A review of the legislation and policy systems in South Korea and Japan shows that these countries have come to possess a complex and comprehensive set of policies on solid waste management in general and solid waste segregation, collection, and transportation, in particular, with the core measure of promoting "Reduce, Reuse, Recycle." Below are figures listing out some successful policies and practices in South Korea and Japan:

Figure 1: Policies and practices in South Korea

Reduction	Reuse and recycling
• Restriction for usage of disposal products • Suppression of packaging waste generation • Waste Charge System (applicable to products not easy to recycle or containing hazardous materials) • Volume-based waste fee system • Food waste reduction campaigns and food waste recycling	• Separate waste collection at the source and free collection for recyclable wastes • Extended Producer Responsibility (EPR) system • Separate disposed mark system • Support for recycling industry • Mandatory recycling and use of construction wastes (concrete and asphalt)

Source: Comprehensive Study of Waste Management Policies and Practices in Korea and Recommendations for LDs and MICs, 2017

Figure 2: Policies and practices in Japan



Source: History and Current State of Waste Management in Japan, 2014.

Among these policies in two countries, regarding South Korea, the author will focus more on analyzing the Volume-based Waste Fee (VBWF) system), separate waste collection at the source, and free collection for recyclable waste (which is also under the umbrella of the VBWF system) because the scope of this Thesis does not fall within the other policies listed. These policies apply to other types of waste such as construction/demolition waste, hazardous waste, industrial/commercial waste, etc. Regarding Japan, the author focuses more on the Waste Management Act and Regulations following the properties of individual products (except for the Construction Recycling Act as the solid waste under the scope of this Act does not fall within the scope of this Thesis). In addition, the author also discusses some other policies related to collection and transportation services in these two countries.

6.1. Solid waste segregation:

In general, although these two countries name their policies in different ways, they share the same categorization of solid waste, including:

- Garbage (mixed/dirty waste)
- Food waste
- Recyclable materials (paper cartons and cups, paper, cans, scrap metals, glass bottles, plastic containers, plastic bags and films, EPS/Styrofoam, other (apparel, fabrics, waste oil, and agricultural waste)
- Waste home appliances (fridges, washing machines, air-conditioners) and bulky objects (dining tables, kitchen sinks, etc.)

6.2. Solid waste collection and transportation:

Although these two countries categorize solid waste similarly, they have different solid waste collection and transportation systems. Accordingly, the South Korean Government employs the VBWF system (covering four types of solid waste mentioned above), charging the residents all the cost (collection, transportation, and treatment) according to the amount of solid waste generated by selling standard solid waste bags, which are compulsory for throwing solid waste. Regarding the Japanese Government, each type of waste has its own governing acts, and the fee is not based on the amount of waste generated.

6.2.1. Policies in South Korea (VBWF system):

VBWF was first introduced in 1995 and applied to solid waste generated by households, small businesses, and the commercial sector.

Separate solid waste collection and transportation are compulsory in South Korea (Ministry of Environment, 2016). Each type of waste has its own collection and transportation. Many local governments collect solid waste on different days of the week to ensure the system's efficiency and productivity (workforce and vehicles). However, to prevent contamination, the local government always makes sure that the recyclable materials and other types of waste such as garbage and food waste are collected on different days. The local governments or the third-party contracts are in charge of collecting solid waste from doorsteps or designed places at designated hours and transport waste to suitable treatment facilities.

a) Garbage: the solid waste generators purchase the standard VBWF plastic bags[10] in grocery stores or supermarkets, then put their waste into those bags. The local government sets the cost of plastic bags; therefore, it is different from town to town and city to city. The cost already includes the production cost, the waste collection, transportation, and treatment fee. The average price is 256 KRW (~ 0.19 EUR) for a 10-liter bag and 503 KRW (~ 0.37 EUR) for a 20-liter bag (Seung-Joon Yoon, 2020). This type of waste is either directly transported to the incineration facilities, landfills, or temporary depository before being transported to the treatment facilities such as incineration, landfills (Ministry of Environment, 2016).

b) Recyclable materials: The inhabitants are required to categorize this type of waste at the source and place them at a waste discharge/collection spot at a designated time and place. For apartment complexes and institutions, the recyclables are collected and sold directly to recycling companies. Unlike food waste and garbage, this type of waste is collected free by the local government or private recycling companies to promote recycling. Finally, the recyclable materials are sent by trucks to the recycling waste facilities/private recycling companies (Ministry of Environment, 2016).

c) Waste home appliances and bulky objects: This type of waste could not be put into the standard VBWF bag, and it must be collected and transported separately. For waste home appliances (televisions, fridges, and washing machines), the Ministry of Environment offers a free door-to-door pickup service. The inhabitants can request this service either by call or online. For bulky objects, inhabitants purchase stickers based on the materials' size and weight from the local government or the private recycling haulers/companies and attach the stickers on the materials.

[10] The local government asserts the right to design the plastic bags. However, they are required to use environment-friendly materials.

The local government regulates the collection and transportation fee, depending on the size and weight of the waste. Both types of waste are picked up at home and transported directly by trucks to recycling facilities, and they must go through a series of recycling processes (Ministry of Environment, 2014).

d) Food waste: for this type of waste, the South Korean government has developed a sub-system under the VBWF system, Weight-Based Food Waste Fee (WBWF), intending to increase the recycling rate and tackle the landfill overload challenge. Before this policy come into effect, the Government already banned direct food waste landfilling since 2005. To manage food waste, the Ministry of Environment set up an RFID food waste management system, weighing the food waste and imposing the collection fees to households based on the amount of food waste generated. According to the Ministry, by 2018, there was 69,055 RFID equipment installed in 149 municipalities (Seung-Joon Yoon, 2020). However, in some small rural areas, the inhabitants still have to discard their food waste into the food-waste tailored VBWF plastic bags or food waste tailored bins, leaving them outside their houses or at a designated place. Then, their food waste is collected and transported to landfills.

e) Other Regulations

- **Illegal dumping**

To prevent illegal dumping and disposal (not using the VBWF bags) and ensure inhabitants follow the guidelines under the VBWF system, the Government includes provisions regulating the administrative fines object to the violators in the Waste Control Act. The fine does not exceed 01 million KRW (around 735 EUR) (Waste Control Act). In addition, these violators must attend a mandatory education program, and their solid waste is not collected for a period.

Besides that regulation, the local authorities install CCTV in places where the violators usually dump their solid waste. The staff in environmental departments are requested to examine and monitor different places at different times (UNDP, 2017).

- **Improvements on collection and transportation services**

To strengthen the efficiency and feasibility of recyclables collection, the local governments, since 2015, have installed the facilities/locations, named Neighborhood Recycling Centers, in areas, such as remote rural areas and neighborhoods of single-detached houses, where the collection for recyclables is quite difficult (Ministry of Environment, 2016). According to the Ministry of

Environment statistic, by 2016, there were 275 centers, which increased the rate of recyclables collection to 11%, and, on the other side, reduced the collection and transportation cost by 30% (Ministry of Environment, 2016).

Figure 3: Before and After installing the Neighborhood Recycling Centers

Besides improving the collection service, the Ministry of Environment also updated and transformed the old-tradition waste vehicles, which leaked the odor, leachate, and garbage, to the new models of vehicles. These new vehicles have sealed cargo boxes, preventing any leakages and scents to the streets. The Ministry of Environment still makes an effort to purchase and distribute more energy-saving, functional, and safer waste vehicles (Ministry of Environment, 2016).

Figure 4: Old and new solid waste vehicles

- **Campaigns raising public awareness on environmental issues**

Acknowledging the pivotal importance of mass media in influencing people's ideas on daily issues in life, the Ministry of Environment has cooperated with mass media to raise public awareness on the environmental issues and encourage the residents to participate in the VBWF system. The Ministry has consistently provided information on the positive impacts of solid waste segregation,

recycling, and the economic benefits of this system to the whole society to the press, and even run advertising campaigns on the TV, radios, etc. (Ministry of Environment, 2016)

The Ministry has also collaborated with the Ministry of Education to include the content on the environment in primary, secondary, and high schools to educate students on environmental problems. In addition, the Ministry also provided the training courses and additional information on these solid waste problems to the teachers in the summer, at no cost (Seung-Joon Yoon, 2020).

As in South Korea, civil groups and religious organizations have considerable influences on the people's opinions and ideas, so the Ministry wanted to take advantage of their powers to exert the Ministry's influence. Therefore, it established the Civic Groups Council for Environmental Consultation (with the participation of 10-20 major environmental NGOs and consumer groups) and the Religious Groups Council for Environmental Consultation and Implementation. These groups propose their recommendations and advice on major policies regarding environmental issues and implement the action plans for significant environmental policies. Thanks to these groups, the VBWF system is spread widely and achieves desired outcomes (Seung-Joon Yoon, 2020).

6.2.2. Regulations in Japan

Sorted solid waste was first introduced in Numazu City and Hiroshima City in Japan during the late 1970s. Thanks to the success of this program in these two cities, many municipalities started to apply solid waste sorting at source during the late 1980s. Since the 1990s, solid waste separation and collection have become compulsory in Japan and are governed through various acts (Ministry of Environment, 2014).

a) Containers and Packaging Recycling Act (Japanese Industrial Waste Information Center, 2018)

This Act targets recyclables such as cans, glass bottles, paper containers, cartons, plastic bottles, containers, etc. The residents are required to sort recyclables, and they are collected by independent groups such as "neighborhood associations, district organizations, and volunteer groups" (Japanese Industrial Waste Information Center, 2018) in a designed place at a specific time. The time is informed in the local signboard or on the local website. This system is named "group collection." Group collection helps the provincial governments save the solid waste collection and treatment cost, increases the recycling rate and raises public awareness about solid waste recycling. In some

municipalities, the local governments even promote this system by providing subsidies to the independent groups that proactively collect solid waste from the residents. The recyclables are then transported to the recycling companies/facilities and the business operators. The businesses/manufacturers are entitled to recycle their product containers and packaging, which incentivizes them to reduce solid waste disposal (normally plastic) packaging and containers in their business operation.

b) Home Appliance Recycling Act and Small Home Appliance Act (Japanese Industrial Waste Information Center, 2018)

The Home Appliance Recycling Act applies to home appliances such as refrigerators, televisions, air conditioners, washing machines, freezers. Under this Act, home appliance retailers are obliged to receive those products and then transport them to the manufacturers for recycling. The consumers are the ones to pay collection, transportation, and recycling fees when throwing these products away.

The Small Home Appliance Act applies to "electronic devices and other electrical appliances used by general consumers in their daily lives, such as PCs, mobile phones, digital cameras, clocks, and hair dryers" (Ministry of Environment, 2014). The local governments entail the right to regulate the collection and transportation procedure in their municipalities. However, primarily, the governments set up the collection boxes in public areas, home appliance stores, or supermarkets. The retailers are entitled to collect and transport those products to the certified recycling operators for dismantling, crushing, and sorting into plastic materials and metals. After that, they are transferred to the metal refineries and manufacturers to start a new life cycle.

c) Food Recycling Act (Ministry of Environment, 2014)

This Act was introduced and implemented in 2000 to reduce food waste and encourage food-related businesses to use more recyclable food resources in their operating procedure. This Act does not specify how to collect and transport household food waste. The residents are obliged to reduce food waste by improving cooking and purchasing food, and the Government also promotes the residents to use more recycled products. For food-related businesses, they are required to reduce food waste, use more recycled products in their operation, as well as their food waste is transported to the recycling operators to make stock feed and fertilizers.

d) Other initiatives

- **Improvements on collection and transportation services**

To increase solid waste collection and transportation efficiency, the Japanese government has improved its collection and transportation service. In Japan, "there are two types of garbage collection trucks - mechanical trucks (Mobile Packers) and compressor-type trucks, but mobile packers are more commonly used. Packers scoop up the garbage with a spinning disk and thrust it into the storage space with a sliding board. Compressor-type trucks press down the garbage onto the floor with a compressor board (pressing plate), and after breaking it up and reducing volume, the garbage is slid into the storage area" (Ministry of Environment, 2013). In climate change and global warming context, electric and hybrid trucks are also being used to reduce the amount of CO2 emissions. These types of trucks have an automatic system of waste loading and unloading, saving labor cost.

Figure 5: Mobile Packers

Source: The Ministry of Environment. (2013). Solid Waste Management and Recycling Technology of Japan – Toward a Sustainable Society.

Figure 6: Electric truck

Source: The Ministry of Environment. (2013). Solid Waste Management and Recycling Technology of Japan – Toward a Sustainable Society

- **Campaigns on raising awareness on solid waste sorting and recycling**

To guide the residents to sort solid waste, the local governments prepare flyers and handbooks and distribute them to the residents in the public areas (there are designated flyers for foreigners as well). They also organized workshops for the residents to educate and train the residents on how to categorize waste and explain the importance of solid waste segregation. The staffs in the competent authorities also encourage the residents to use their own bags when going to the supermarkets for grocery shopping (Ministry of Environment, 2013).

To raise public awareness on solid waste sorting and recycling, many localities also set up recycling centers in the public areas so that the residents could see a life cycle of a product and the way the solid waste is recycled and transformed into new products (Ministry of Environment, 2013).

Apart from the local governments, the Ministry of Environment also runs many campaigns to promote waste sorting and recycling, as well as 3R idea, notably, the Environmentally Friendly Shopping Campaign. In this Campaign, many activities are undertaken, such as encouraging the residents to use their bags and buy either recycled or environmental-friendly products, promoting the manufactures to reduce the amount of single-use plastic in their products, etc.

6.3. Outcomes

These policies have yielded a lot of positive impacts in South Korea and Japan.

As of 2014, the amount of solid waste produced in South Korea was 49,000 tons per year, reduced by 18%, compared to the total solid waste generated in 1995 (58,000 tons) (Ministry of Environment, 2016). Similar patterns are reported in the amount of solid waste discarded per capita per day, from 1.3 kilograms in 1994 to 0.95 kilograms in 2014 (Ministry of Environment, 2016). An analysis by the Ministry of Environment in 2014 stated the aggregated economic value of this system between 1995 and 2013 was estimated at 21.4 trillion KRW (15.7 billion EUR) (Ministry of Environment, 2016). In general, there has been a significant increase in solid waste segregation. After 20 years of implementation, the recycling rate was 59% in 2014 (compared to 15.4% in 1994), and the rate of food waste being mixed with other types of waste was reduced significantly, from 31.6% in 1995 to 2.1% in 2014 (Ministry of Environment, 2016). One survey conducted by the Ministry of Environment also showed that only 11.6% found recycling to be annoying (Ministry of Environment, 2016). It implied that the VBWF system had become an integral part of the South Koreans' daily lives.

According to the statistic by the Ministry of Environment, Japan experienced a significant decrease in household waste, from 36.8 million tons to 31.2 million tons (15%), in business-related waste, from 18 million tons to 13 million tons (27%), between 2000 and 2014 (Gemechu and Akihiro, 2020). The total municipal solid waste was reduced by 22% from 2000 to 2017 (from 54.8 million tons to 43 million tons) (Gemechu and Akihiro, 2020). The amount of solid waste discarded per capita per day was reduced to less than 1 kilogram and it was reduced by 22%, from 1.1 kilograms per day in 2000 to 0.920 kilogram per day in 2017 (Kaza et. al., 2018). Besides, there had been a steady increase in the recycling amount in Japan; the amount of recycling waste in 2017 was three times bigger than that's in 1990 (267,000 tons versus 868,000 tons) (Kaza et. al., 2018).

Model test and findings

First, based on a set of seven questions set by Dolowitz, the author wants to test whether South Korea and Japan policies could be employed in Vietnam. Table 5 presents the summary of the test and the findings.

Table 3: Model test and findings

	Model theory – VBWF system	**Model theory -Japanese policies**	**Vietnam**
Why transfer?			Voluntary/Mixtures/Coercive? **Voluntary**
Who is involved?	The South Korean Government	The Japanese Government	The National Assembly (in charge of issuing the Law) The Vietnamese Government (in charge of drafting the Law and issuing the bylaws)
	Ministry of Environment, Ministry of Education, Municipalities (local governments)	Ministry of Environment, Municipalities (local governments)	MONRE, MOC, Ministry of Education (MOE), municipalities, local environmental departments
	Civil Groups Council for Environmental Consultations, Religious Groups Council for Environmental Consultation, and Implementation		Vietnam Association for Conservation of Nature and Environment
	Public Attitudes and Awareness: **high**	Public Attitudes and Awareness: **high**	Public Attitudes and Awareness: **low**
			World Bank, UNEP
What is transferred?	**Goals:** ▪ to reduce the amount of solid waste ▪ to increase the rate of recycling ▪ to contribute to the sustainable development	**Goals:** ▪ to reduce the amount of solid waste ▪ to increase the rate of recycling	**Goals:** ▪ to reduce the amount of solid waste ▪ to increase the rate of recycling ▪ to contribute to the sustainable development ▪ to sustain the collection and transportation cost
	Main measures implemented: ▪ VBWF disposal bags ▪ Solid waste segregation at source	**Main measures implemented:** ▪ Each type of waste has its own governing act.	**Measures that could be implemented:** ▪ **VBWF disposal bags:** This measure aims to ensure the solid waste generators pay for the amount of solid waste they discard. Currently, the MONRE also proposed to include one regulation that is somehow similar to

	▪ Recycling promotion (free collection and transportation) ▪ Separated solid waste collection and transportation ▪ Punishments on illegal solid waste disposal ▪ Improvements on collection and transportation services ▪ Public awareness campaigns	▪ Solid waste segregation at source ▪ Recycling promotion ▪ Improvements on collection and transportation services ▪ Public awareness campaigns	this idea. Basically, more solid waste is discarded, more fees have to be paid. Besides, in Vietnam, some producers are providing eco-friendly waste bags with affordable prices regarding the materials of the bags. This also helps to create more funds for the collection and transportation service. Therefore, this measure could be considered to be applied in Vietnam. ▪ **Each type of waste has its own governing act:** To fashion and implement an act of each kind of solid waste, one of the first things that need to be accomplished is solid waste sorting. For years, solid waste sorting has become an integral part of Japanese's daily lives; therefore, it is easier for the Government to issue and implement these acts properly. In Vietnam, public awareness about solid waste separation is still deficient. Consequently, it is hard to develop such a sophisticated legal system of solid waste management like Japan's, while proper solid waste sorting has not been achieved in Vietnam. ▪ **Solid waste segregation at source:** As mentioned above, the Government already regulated this issue in its legal documents. However, the solid waste segregation rate is still very low as people see no incentives for solid waste segregation at the source. Vietnamese do not acknowledge the importance of solid waste sorting that well. Therefore, public awareness-raising programs/campaigns and strict (but specific) regulations are needed to implement this measure. ▪ **Recycling promotion**: In Vietnam, there are many waste pickers/collectors, junk dealers (known as the informal sector) who play an essential role in the recycling industry. However, their activities are spontaneous and lack official management as many households sell used items/recyclables to second-hand shops, informal waste pickers instead of collecting and providing them to the waste collectors from the urban environmental companies. Therefore, in the Vietnamese situation, integrating this informal sector into municipal waste management might become a solution for waste generation and help to extend the life cycle of products.

			▪ **Separated solid waste collection and transportation**: It is challenging to apply this measure in the current Vietnamese situation due to the lack of human resources, financial resources and technological equipment. ▪ **Punishments on illegal solid waste disposal**: There is no harsh punishment for illegal solid waste disposal in Vietnam. Not many CCTVs have been installed, even on the main streets, not to mention the deserted places. To implement this measure, the Government has to spend much money on installing the CCTVs, and more staff is required to monitor and examine areas at different times. Therefore, it is not feasible. ▪ **Improvements on collection and transportation services**: This measure in both countries requires large financial resources. Therefore, it is quite challenging to apply it in Vietnam. ▪ **Public awareness campaigns**: The MONRE and some municipalities have organized some campaigns on enhancing people's awareness and encouraging behavior changing. However, these campaigns/programs do not strongly influence inhabitants as the competent authorities fail to sync these programs/campaigns. They are organized sporadically and not continuously for such a long time. Therefore, the measure employed by the Korean Ministry of Environment could be considered to be implemented. Besides, the idea to distribute the flyers to the residents by municipalities in Japan can be easily applied in Vietnam due to low cost and high efficiency.
From Where	Within a Nation/Cross-National		Cross-National
Degree of transfer	Copying/Emulation/Mixtures/Inspiration		Mixtures of several other different policies (to fit with the context of Vietnam)
Constraints on transfer	Policy complexity	▪	▪ Lack of resources (human resources, technology, finance), especially financial ones ▪ Low level of public awareness on solid waste issues

How transfer leads to Policy Failure			Uninformed transfer/Incomplete transfer/Inappropriate transfer? **Incomplete transfer** (due to the constraints on resources, it may be challenging to adopt the key factors of the VBWF system and Japanese policies).

Chapter 7: Policy recommendations

This chapter presents a set of specific policy recommendations to the Vietnamese Government to address the current issues in solid waste segregation, collection, and transportation.

7.1. Recommendations on the institutional and legal framework

a) Institutional

As mentioned above, currently, there are overlaps between the responsibilities of the MONRE and MOC on governing solid waste management in general and solid waste segregation, collection, and transportation, in particular. Therefore, the Government should look at the legal documents regarding solid waste management, revise, amend and supplement the regulations governing the authorities and responsibilities of competent authorities, from the central to the local. Furthermore, the adjustment of duties and responsibilities of competent agencies in solid waste management must ensure rationality and feasibility and avoid fragmentation and overlap. Accordingly, it is necessary to organize a solid waste management system and assign specific responsibilities to two groups of management units: a group in charge of direction and orientation of solid waste management and a group in charge of performing and implementing the solid waste management policies.

It is necessary to determine a ministry as a focal point for solid waste management in general at the central level. Other ministries and departments must collaborate with the focal point ministry to properly implement solid waste management and treatment policies. Similarly, at the local level, a corresponding specialized agency should be identified as the focal point to support the local People's Committees manage the solid waste issues. In addition, solid waste management also requires the participation of solid waste generators, dischargers and collectors, transporters, civil groups, and the whole community.

b) Legal

- **Legal regulations on solid waste segregation at source**

  (i) The Government should consider redefining the term "solid waste" and the categorization of solid waste under the Decree 38/2015/ND-CP as it lacks a lot of fractions. It is not clear if market waste, bulky waste, home appliances, electronic equipment, etc. are under the umbrella of this definition and

categorization. Therefore, adoption of the definition set by the South Korean and Japanese Government is recommended (with four main types: garbage, food waste, recyclables, home appliances, and bulky waste).

(ii) Solid waste segregation at source is mandatory, and it should be included in the new Law on Environmental Protection. In addition, a monitoring and supervision system from the local level to the national level to keep track of the process and the rate of solid waste segregation needs to be regulated in the bylaws.

(iii) The Government should assign the municipalities to regulate the solid waste bags (size of the bags, materials, and the specified color for each type of solid waste). Currently, besides some companies produce eco-friendly waste bags such as An Phat Holdings, Green Future, etc., there are many waste bags labeled "biodegradable waste bags"; however, the effects and impacts of those bags are questioned. Therefore, it is necessary to regulate the materials of these waste bags. Therefore, adoption from the South Korean regulations regarding this issue is highly recommended.

(iv) Violations on waste sorting at the source should be included in the new Law or bylaws and object to administrative fines. The waste collectors and transporters have the right not to collect and transport the solid waste bags if the solid waste is not sorted appropriately. Learning from the Korean experience, the violators must attend training/educational programs on solid waste segregation and environmental issues.

- **Legal regulations on solid waste collection and transportation**

(i) The Government should include specified and stricter rules on the requirements of waste vehicles, such as trucks, carts, tricycles, etc.

(ii) A detailed and tailor-made design of separated collection and transportation systems to ensure the quality of the solid waste materials for the solid waste treatment and encourage inhabitants to sort solid waste at the source should be developed in each municipality following a roadmap as it will cost the central and local governments much money and it takes time. For example, South Korea and Japan have developed their system to recycle end-of-life home

appliances, ensuring that they could be recycled and reused. Moreover, due to the global problem of climate change, low-pollution-type garbage trucks such as electric motor-drive and hybrid trucks should be developed and put into practical use.

(iii) A monitoring and supervision system on these activities should be developed in each municipality. Besides competent authorities, academic and research organizations are encouraged to evaluate the system and provide feedback. Besides, the municipalities should encourage residents to report any violations in this sector (if any).

(iv) Current administrative fines imposed on solid waste collection and transportation violations are too low, a maximum fine of 4,000,000 VND (147 EUR), which could not act as a warning for people who work in this sector. In Japan, those who do not follow the requirements related to solid waste collection, transportation, and disposal, might be sent to prison (five years at the maximum) and/or subjected to an administrative fine (10,000,000 yen (~76,900 EUR)).[11]Therefore, the competent authorities could apply stricter administrative penalties for any violations related to this issue.

(v) More transfer stations/points need to be installed to increase efficiency and reduce solid waste collection and transportation costs.

7.2. Recommendations on financial resources

- **Collection and transportation fees:** As mentioned above, the collection and transportation fees are too meager now, and it is much lower than international standards. The collection and transportation fees paid by the household cannot make up for the actual cost of solid waste collection and transportation. Increasing the collection and transportation fee is necessary to ensure the quality of the activities and the operation of the solid waste management system. The Government could consider applying South Korea's policy. The cost of the solid waste bags comprises the cost of collection, transportation, and treatment, and the local government is assigned to set this cost based on the local economic situation and local producers. However, it should

[11] Article 25, Waste Management and Public Cleansing Law.

be applied pursuant to a specific and comprehensive roadmap so residents could get used to it gradually. It should be acknowledged that the fee paid by the residents could only partially cover the total cost of solid waste collection, transportation, and treatment. This process has to depend much on the Government's subsidy. In addition, there is a need to increase public awareness about the importance of solid waste sorting and treatment so that this policy could be implemented appropriately with supports from the residents. Regarding the recyclables, they should be collected and transported free to limit solid waste generation and promote recycling behavior in households. The municipalities should establish a network of certified local recycling centers/companies/facilities and work closely with them to develop a system of collecting recyclables effectively and efficiently.

- **Granting state credit:** To improve the efficiency of solid waste collection and transportation, the Government should consider expanding the state credit support or granting the funding to recycling projects or state-owned companies operating in this solid waste collection and transportation sector. More than that, giving them incentives such as taxes, charges also creates a chance for them to save the cost and invest more in the vehicles.

- **Promoting privatization:** The Government should shorten and simplify the investment procedures, provide specific preferential policies, employ appropriate technological solutions, and allow the private enterprises to involve in the solid waste management system (especially solid waste collection and transportation) in order to promote the socialization and privatization in the solid waste collection, transportation, and treatment. In addition, speeding up the equitization process of state-owned enterprises operating in the solid waste collection, transportation and treatment is also necessary to attract more investment into this sector.

7.4. Recommendations on technology

- **Technical guidance:** Developing technical guidelines for each group of classified solid waste vehicles, methods of separated solid waste collection, and transportation is counted as a vehicle of choice for shaping the policy instruments in this sector.

- **Database on solid waste:** Setting up, updating, and integrating the database on solid waste management (the rate of solid waste sorting, collection, and transportation) into the national environmental database system annually and applying information technology in solid waste collection, transportation, and treatment activities are required to ensure an effective and proper solid waste management system.

7.5. Public awareness programs/campaigns

Understanding, participation, and cooperation among the residents and government bodies are critical in solving disputes over waste management. Public involvement is enhanced through environmental education and awareness creation programs. The first step should be to review and evaluate the effectiveness of the existing training, communication, and public awareness programs on solid waste collection, transportation, and treatment thoroughly. Then, each municipality has to invest heavily in developing a roadmap on how to fix the issues cushioning the desired results and organize regular and effective programs.

Drawing lessons from the Japanese experience, the municipalities could prepare the flyers using illustrations with plain language, explaining how to sort solid waste at the source and distribute it to the residents. These flyers could be hung on the information signboards in the public areas so the residents could see and follow the guidelines.

Another recommendation is to develop and implement training and communication programs to raise community awareness in schools, residential communities, state agencies, production, and business establishments on solid waste reduction, sorting, recycling, reuse, disposal based on each objects' perception.

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Annex: Thesis Report

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Waste management in ASEAN countries and lessons for Vietnam

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Table of content

The provisional title of the Thesis

Waste management in ASEAN countries and lessons for Vietnam

Introduction

Having developed its industrial base and witnessing an economic boom, the economy of Vietnam has become highly urbanized in the last four decades since Doi Moi[12]. Along with the development of the overall economy, there has been a significant increase in the volume of waste generated, especially solid waste. A lot of factors have contributed to this rise in waste generation, including population and industrial growth, urbanization, increase in demand and consumption, to name a few. According to the statistics by the Vietnamese Ministry of Construction, Vietnam generated approximately 61,000 tonnes of solid waste every day and 16 million tonnes of solid waste for the whole year in 2019, and almost all of them are not well-treated[13]. It is expected that by 2030, Vietnam will produce about 54 million tonnes of solid waste[14], three times higher compared with the amount of solid waste generated in 2019. The significant increase in waste every year has put a lot of pressure on the Vietnamese waste management infrastructure (related to waste collection, transportation, and disposal). Landfills and open dumps are favored waste treatment methods in Vietnam, and many of them are overloaded owing to the rapid increase amount of waste.

Therefore, implementing sustainable waste management, especially solid waste management, to combat the increase in waste generation has become one of the top priorities of the Vietnamese Government in recent years. Accordingly, the prime goal of the Vietnamese Government when developing a waste management policy framework is to achieve sustainable development in the upcoming future, which could be specified into four subsidiary ones, including (i) preventing, controlling, and substantially limiting the increase in the waste generation (ii) minimizing

[12] Doi Moi is a comprehensive reform program that encompasses the economy and many other aspects of social life initiated by the Communist Party of Vietnam in the 1980s. Congress Party of Vietnam VI, 1986

[13] Góc nhìn đại biểu; rác thải – tài nguyên hay thảm họa? http://quochoi.vn/UserControls/Publishing/News/BinhLuan/pFormPrint.aspx?UrlListProcess=/content/tintuc/Lists/News&ItemID=41630 (accessed on August 20, 2020)

[14] Quả tải rác: ngòi nổ cho "Cuộc xâm chiếm của rác thải" https://vietnam.panda.org/?uNewsID=364197#:~:text=L%C6%B0%E1%BB%A3ng%20ch%E1%BA%A5t%20th%E1%BA%A3i%20r%E1%BA%AFn%20thu,v%C3%A0%20c%E1%BB%99ng%20s%E1%BB%B1%2C%202018). (accessed on August 20, 2020)

environmental pollution caused by waste, (iii) protecting human health, and the environment, and (iv) responding to climate change.[15]

Vietnam has a sound legal and policy framework on waste management; however, owing to a lot of challenges that the country is facing, the current waste management system in Vietnam fails to meet the abovementioned initial objectives of the Government. To the best of the author's knowledge, there is a lack of studies working on waste management in Vietnam as a whole; most of the studies focus on specific regions/cities. Besides, barely any studies explore the potential of well-implemented waste treatment models in the Association Southeast Asian Nations (ASEAN) countries to be employed in Vietnam.

Therefore, the findings of this Thesis provide some implications for the Government of Vietnam and researchers in waste management sector to shorten the gaps. Accordingly, the prime objectives are to have a clear idea of the Vietnamese Government's policy and implementation of solid waste management, point out the current challenges that the country is facing, and propose several policy recommendations to the Government of Vietnam to improve the current situation. To do that, the author will first examine the current Vietnamese situation, policy framework, and challenges in waste management in Vietnam, then look at the current waste management policies in ASEAN countries as nine out of ten ASEAN countries (except for Singapore) are still-developing countries which have kind of similar socio-eco situation to Vietnam and face the same waste management issue. Based on that analysis, the author would like to choose some well-established models in ASEAN countries, to name a few, USWAG Calahunan Livelihood Association Inc. (UCLA) in the Philippines,[16] and Clean Development Mechanism[17] in ASEAN countries, and examine whether these models could be well-employed and adopted in Vietnam.

Discussion on waste and waste management

Scholars, researchers, as well as the Governments (through legal documents), develop their definition of solid waste. According to the Resource Conservation and Recovery Act (RCRA)[18],

[15] Chiến lược quốc gia về quản lý tổng hợp chất thải rắn, http://vpcp.chinhphu.vn/Home/Chien-luoc-quoc-gia-ve-quan-ly-tong-hop-chat-thai-ran/20185/23936.vgp, 2018 (accessed on August 20, 2020).
[16] UCLA is an initiative in integrating the informal sector into the municipal solid waste management program
[17] Clean Development Mechanism is a technology to treat municipal solid waste and further emissions includes landfilling with biogas recovery, composting of selected waste fractions, anaerobic digestion, and thermal processes including incineration, gasification, and pyrolysis.
[18] Resource Conversation and Recovery Act is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste.

solid waste is "any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, resulting from industrial, commercial, mining, and agricultural operations, and community activities."[19] Beranek stated that solid waste is a companion of many types of waste, resulting from multiple human activities such as agricultural or industrial ones.[20] Solid waste is not either liquid or gas, and they are something animal or human does not want, as defined by Jess W. Everett in his paper about solid waste disposal.[21] Under Decree 38/2015/ND-CP issued by the Government of Vietnam, solid waste is waste in solid form, which is generated from production, business, service, household activities, and other ones.[22] In short, solid waste is something being discarded and unwanted from human and animal activities. Solid waste covers almost the amount of waste generated by all the activities.

According to the World Bank's statistic, about 2.01 billion tonnes of solid waste was generated in all the cities in the world in 2016, which means that each person produced 0.74 kilograms of waste per day. They also estimated that by 2030, the world is expected to generate about 3.40 billion tonnes, approximately 1.5 times compared with the amount of waste in 2016.[23] With a massive amount of solid waste being generated, the quantum of which is expected to increase every year, a feasible and effective solid waste management policy governed by the government in each country is vital for the world to achieve sustainable development goals. Having said this, effectively and efficiently managing solid waste remains a severe issue for underdeveloped and developing countries.

So, what is waste management and a sustainable waste management system?

There are multiple papers studying and discussing waste management all over the world, generally and developing countries particularly. Scholars have different perspectives on waste management.

[19] United States Environmental Protection Agency, Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions, https://www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions (accessed on July 30, 2020)
[20] Beranek, W., (1992), Solid Waste Management and Economic Development. Economic Development Review, 10, 49
[21] Jess W. Everett., (2012), Solid Waste Disposal and Recycling, Environmental Impacts, Encyclopedia of Sustainability Science and Technology.
[22] Decree 38/2015/NĐ-CP, http://vbpl.vn/botainguyen/Pages/vbpq-van-ban-goc.aspx?ItemID=63061
[23] World Bank, (2019), Solid Waste Management, https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management (accessed on August 02, 2020)

George Halkos and Natalia Petrou categorized waste management into four options, including "landfill, incineration, recycling and composting."[24] Tchobanoglous et al. and Demirbas have a similar definition of waste management; accordingly, waste management is a process of collecting, transporting, processing, recycling, or disposing and monitoring of waste products.[25][26] Tchobanoglous et al. also argued that waste management protects human health and the environment while Demirbas illustrated that that activity aims to ensure a safe environment[27].

The Vietnamese Law on Environmental Protection also gives a definition of waste management in Article 3.15 as "a process of preventing, minimizing, monitoring, aggregating, collecting, transporting, reusing, recycling and disposing of waste material." Although each has its waste management system, however, according to Vergara & Tchobanoglous, there are some irreplaceable steps in the process of waste management, as shown in Figure 3. Household waste needs to be collected, and after that, it will either be recycled thanks to the recycling industry or transported to a storage place before transferring them to a waste landfill or composting.[28]

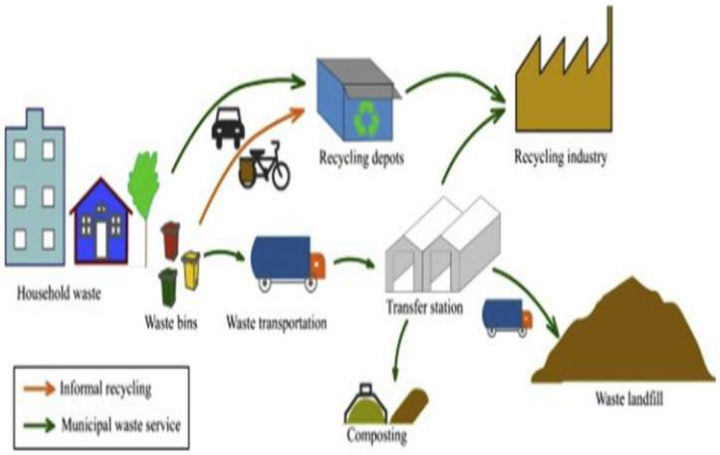

Figure 3: Waste management process
Source: Ebikapade Amasuomo and Jim Baird, 2016, The Concept of Waste and Waste Management, Journal of Management and Sustainability, Vol 6, No 4

[24] George Halkos and Kleoniki Natalia Petrou, (2016), Efficient waste management practices: A review. Technical Report, 2.
[25] Tchobanoglous, G., Theisen, H., & Vigil, S. (1993). Integrated Solid Waste Management: Engineering Principles and Management Issues. Water Science & Technology Library, 8(1), 63-90
[26] Demirbas, A. (2011). Waste management, waste resource facilities and waste conversion processes. Energy Conversion & Management, 52(2), 1280-1287. https://doi.org/10.1016/j.enconman.2010.09.025
[27] Ebikapade Amasuomo and Jim Baird, (2016), The Concept of Waste and Waste Management, Journal of Management and Sustainability, Vol 6, No 4
[28] Vergara, S. E., & Tchobanoglous, G., (2012), Municipal Solid Waste and the Environment: A Global Perspective. Environment and Resources, 37(37), 277-309. https://doi.org/10.1146/annurev-environ-050511-122532

In the final report on March 2014 of a study conducted by the Institute for Environmental Strategy, sponsored by the European Commission, the authors mentioned that the ultimate objective of waste management is a whole set of activities such as recycle, reuse, and reclaim to "extract secondary raw materials."[29] According to the European Commission, reducing and preventing the waste being produced are considered as effective waste management.[30] European Commission also emphasizes the waste management measures should meet the objective of public health and environment protection in Article 4, Waste Framework Directive according to which "Member States shall take the necessary measures to ensure that waste is recovered or disposed of without endangering human health and without using processes or methods which could harm the environment."[31] According to the UK Department for Environment, Food, and Rural Affairs, to achieve sustainable waste management, waste should be reduced as much as possible, and even when waste is generated, it should be reused, then recycled, recovered, and finally disposed.[32] Accordingly, the most favored option in sustainable waste treatment is waste avoidance or prevention, and the least favored option is waste disposal.

The United Nations Environment Program (UNEP) in a report also introduces a balanced hierarchy of waste management for developing countries in Asia, starting from waste reduction and sustainable consumption and production to landfill mining and reclamation. Accordingly, reducing waste and pursuing sustainable consumption and production are the first steps. Sustainable consumption and production mean "the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations."[33] In general, it refers to a better way of producing and using products and services in daily lives, which help reduce the amount of waste not necessarily. As this hierarchy goes the same way with the UK Department for

[29] Knut Sander, Dirk Jepsen, Stephanie Schilling, and Christian Tebert, (2004). Definition waste recovery and disposal operation, https://ec.europa.eu/environment/waste/studies/pdf/r_d_part_a.pdf, 34.
[30] European Commission, (2010), Being wise with waste: the EU's approach to waste management https://ec.europa.eu/environment/waste/pdf/WASTE%20BROCHURE.pdf, 4.
[31] Knut Sander, Dirk Jepsen, Stephanie Schilling, and Christian Tebert, (2004), Definition waste recovery and disposal operation, https://ec.europa.eu/environment/waste/studies/pdf/r_d_part_a.pdf, 34
[32] The UK Department for Environment, Food & Rural Affairs, (2011b) Guidance on applying the Waste Hierarchy.
[33] Sustainable consumption and production policies, unenvironment.org/explore-topics/resource-efficiency/what-we-do/sustainable-consumption-and-production-policies#:~:text=Sustainable%20Consumption%20and%20Production%20(known,efficiency%20and%20promoting%20sustainable%20lifestyles (accessed August 19, 2020)

Environment, Food and Rural Affairs', the final destination of waste is landfill mining and reclamation, as illustrated in Figure 4.[34]

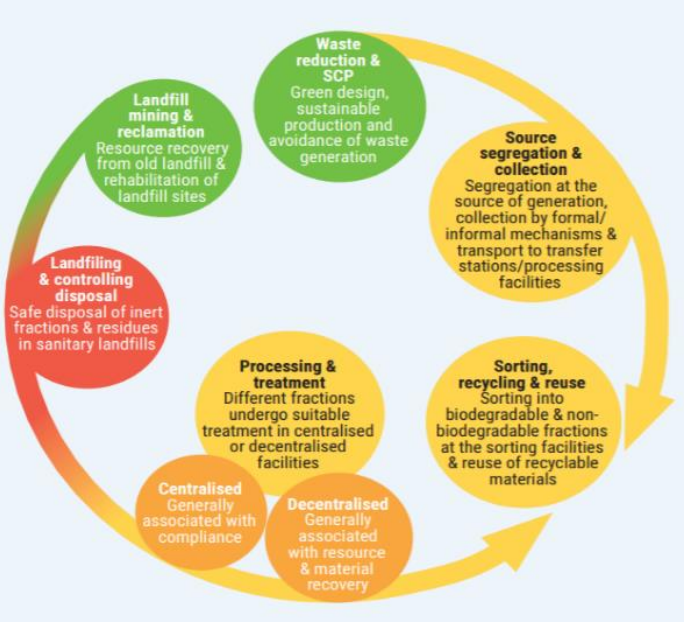

Figure 4: Balanced and sustainable hierarchy of waste management Source: UNEP, Highlights Asia Waste Management outlook summary for decision-makers.

In the last two decades, a new concept that covers sustainable waste management was introduced and known as a "circular economy" (CE). Each country has its approach to the CE. Let's take China and the European Union as examples. China focuses on "cleaner consumption and production" and "reduce, reuse and recycle"[35] when applying the CE while European countries follow the "Cradle to Cradle" model[36] (considering waste as a resource) and the "closed-loop economic model"[37] (the materials are reused again and again to produce new products purchased in the market).[38] However, in general, it is an economic system that attempts to eliminate wastes and keep materials and products in continuous use, bringing benefits to the community. Figure 5 shows precisely how the CE operates. While the linear economy go through the whole process of "take-make-consume-waste" and the recycling economy operates in the form of "take-make-consume-recycle", the CE

[34] United Nations Environment Programme, 2016, Highlights Asia Waste Management outlook summary for decision-makers.
[35] Thibaut Wautelet. (2018). The Concept of Circular Economy: its Origin and its Evolution. 11-30
[36] This model was developed by in the 1990s by Prof. Dr. Michael Braungart, William McDonough and EPEA Hamburg
[37] This model was developed by Water R. Stahel
[38] Thibaut Wautelet. (2018). The Concept of Circular Economy: its Origin and its Evolution. 11-30

breaks those traditional patterns of growth and moves to an endless cycle, starting from raw materials, design, production or remanufacturing, distribution, consumption, use, reuse or repair, collection and recycling of what can be recycled to reinsert these new materials at the beginning of a new cycle.

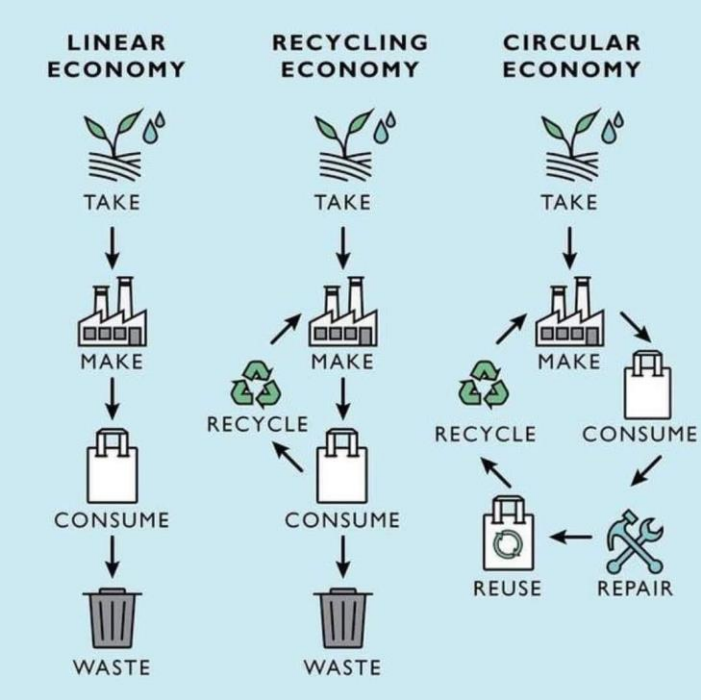

Figure 5: Linear economy, Recycling Economy versus Circular economy

The CE brings considerable benefits to the world, including creating more jobs, more eco-friendly industries, and products, reducing the dependence on raw materials, protecting the environment as it reduces a significant amount of waste produced, boosting economic growth, and promoting the sustainable innovations. Since acknowledging the benefits of the CE, developed countries such as the EU, Japan, or New Zealand have experienced and promoted for the development of this new concept; even in Japan, the transition towards circular economy appeared very early since 1991. Many researchers also urged the leadership of both developed and developing countries to make great efforts to eliminate all the challenges and make a transition to the CE.[39][40]

[39] Sunday A. Owolabi, Daniel Mmereki, Andrew Baldwin & Baizhan Li, (2016), A comparative analysis of solid waste management in developed, developing and lesser developed countries, Environmental Technology Reviews, 5:1, 120-141, DOI: 10.1080/21622515.2016.1259357.

[40] European Parliament, Circular Economy: definition, importance and benefits, https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits#:~:text=Moving%20towards%20a%20more%20circular,jobs%20in%20the%20EU%20alone),

Pursuing sustainable waste management becomes a top priority of many countries as waste mismanagement is the leading cause of catastrophic social and environmental consequences.[41][42] However, sustainable waste management remains a big challenge for many countries all over the world, especially underdeveloped and developing countries, as these countries have limited resources in technology, infrastructure, finance, and human capability.

Research question

The central research question is, "*How can the Vietnamese Government employ the waste management policies adopted from other countries in the ASEAN region to achieve its goal on sustainable development?"*. Following this, there are subsidiary questions to address the content of the Thesis:

(i) How does the Vietnamese Government design, formulate, and implement a policy framework on waste management?

(ii) Why cannot the current policy framework help the Vietnamese Government achieve sustainable development? What is the gap between the Vietnamese Government's policies and the Vietnamese Government's actions?

(iii) How do other ASEAN countries manage to cope with the waste management issue? To what extent which policies in which countries should the Vietnamese Government should adopt? How could they adopt those policies in the Vietnamese context?

Literature review

This chapter will first review the studies which have already been conducted in Vietnam about waste management; then, it goes through studies in ASEAN countries to have a general picture of the current situation of waste management out there. In general, almost all the studies in developing countries and ASEAN have focused on the causes of an ineffective and unsustainable waste management system. While some have proposed recommendations for the governments, they are, however, dated, with few of them illustrating Vietnam as a case study. Regarding studies on Vietnamese waste management, except for the World Bank report in 2018, there has been barely

(accessed on August 19, 2020)

[41] Working Group of Environmental Auditing, Problems caused by mismanagement of waste, https://sisu.ut.ee/waste/book/13-problems-caused-mismanagement-waste (accessed on August 02, 2020)

[42] Navarro and Vincenzo, (2019), Waste Management in Developing Countries: A Review of Global Issues.

any research to study and analyze the current overall situation of waste management in Vietnam and how the Vietnamese Government could adopt other successful models from other countries to fix waste management process.

Literature review on waste management policies in Vietnam

Most of the studies on waste management in Vietnam are dated. In 2004, the Vietnamese Ministry of Natural Resources and Environment worked closely with the World Bank and the Waste- Econ Project (under the Canadian International Development Agency) to produce Vietnam Environment Monitor on solid waste. It is a comprehensive study with extensive data and findings of waste generation, waste recycling, management issue, challenges, and priorities. Although it is dated, this report provides some exciting but useful results for other scholars as well as government authorities. For example, Hanoi, the capital of Vietnam, experienced a relatively high recycling rate (13-20%) at the household at that time because many families used to sell used items to second-hand shops/waste pickers, and the informal sector recycled about 22% of total wastes produced in Hanoi.[43] The authors stated some facts that there had been no information available on the recycling rates or the number of waste pickers/collectors at the national level, or most of the waste in Vietnam was disposed of in open dumping,[44] which is still valid until now. Those pieces of information were once confirmed by a study conducted by Abdelnaser Omran and Maria Agvrilescu in 2007, which considered Vietnam as a case study. In that paper, they looked at a whole process of waste management in Vietnam, from waste generation, compositions, recycling, collection, and transfer systems, to disposal methods. They also illustrated future challenges and tried to attempt some recommendations for improving the whole system in Vietnam.[45]

As mentioned before, open dumping/landfill is a predominant method in Vietnam. In the two biggest cities of Hanoi and Ho Chi Minh city, solid waste is mainly dumped or burned, with the rate at 90%.[46] According to the World Bank report, until 2004, of all 91 landfills, there were only 17 sanitary ones, and among 61 provincial capitals, only 12 are hygienic landfills.[47] Nguyen, in her study conducted in 2004, elucidated that almost the landfills in Vietnam did not have covers, and

[43] The World Bank, 2004, Vietnam Environment Monitor on Solid Waste, 8.
[44] The World Bank, 2004, Vietnam Environment Monitor on Solid Waste, 8-10.
[45] Abdelnaser Omran and Maria Gavrilescu, 2008, Municipal solid waste management in developing countries: A perspective on Vietnam, Environmental Engineering and Management Journal.
[46] Tổng Minh, (2020), Hơn 900 bãi chôn lấp rác, Việt Nam xử lý cách nào, https://baotainguyenmoitruong.vn/hon-900-bai-chon-lap-rac-viet-nam-xu-ly-cach-nao-302818.html (accessed on August 02, 2020)
[47] The World Bank, (2004), Vietnam Environment Monitor on Solid Waste, 8-10.

these even were built near residential areas.[48] According to Thuy, dumps in Vietnam failed to comply with sanitary requirements as regulated in legal regulations as there were no fences, no liners, and no leachate drainage system.[49] After 16 years, the number of landfills already increased to 900 landfills, of which about 20% are sanitary ones, as informed by the General Department of Environment, Vietnamese Ministry of Natural Resources, and Environment.[50] Even in sanitary landfills, they do not have an appropriate leachate treatment system, and the existing system fails to meet the national technical standards. This proves an explosive increase in waste generation in Vietnam, and this situation has not improved even after nearly 20 years of development.

In 2018, the World Bank, in collaboration with the Vietnamese Ministry of Natural Resources and Environment assessed the solid and industrial waste management, giving a general overview about the current situation in domestic waste management in Vietnam; however, they only gave solution options/scenarios for some selected cities such as Hanoi, Phu Tho, and Hai Phong.

In fact, to the best of the author's knowledge, limited papers are published on solid waste management in developing countries or Asia, in which the authors included Vietnam as an example of a chapter, and presented the situation of Vietnam at that time such as Summary Report: Waste Management in ASEAN countries by UNEP; Solid Waste Management: Issues and Challenges in Asia by the Asian Productivity Organization. However, in the paper published by the Asian Productivity Organization, in the chapter on Vietnam, the authors only focused on four big cities/provinces, including Hanoi, Hai Phong, Hai Duong, and Quang Ninh. This becomes a common point when foreign as well as Vietnamese researchers carry out any study on waste management in Vietnam. They often focus more on analyzing the waste management situation and giving policy recommendations in a specific region/city instead of the national level. Usually, the researchers pay more attention to big cities/provinces such as Hanoi, Ho Chi Minh City, Hai Phong, or Da Nang, instead of small cities or mountainous areas because it is easier to collect data and information from big cities.

R.L. Verma, G. Borongan, and M. Memon once produced a paper on waste management in Ho Chi Minh City in 2016. They analyzed the situation of Ho Chi Minh city-based on the SWOT model

[48] Nguyen, T.Y., (2004), Bo-waste reuse program: the contribution of a positioning campaign: the case of Hanoi, Vietnam, PhD theis, University of Wageningen, the Netherlands
[49] Thuy V.M., (2006), Solid waste management technology in Vietnam.
[50] Tống Minh, (2020), Hơn 900 bãi chôn lấp rác, Việt Nam xử lý cách nào, https://baotainguyenmoitruong.vn/hon-900-bai-chon-lap-rac-viet-nam-xu-ly-cach-nao-302818.html (accessed on August 02, 2020)

(strengths – weakness, opportunities, and threats). They pointed out that there have been a significant number of gaps in "the regulation and economic policies, institutions framework and arrangements, technologies and infrastructure, capacity building, the participation of stakeholders, and financing mechanism."[51] Based on their analysis, they proposed a multitude of recommendations to the leadership of Ho Chi Minh city, and among those recommendations, they noted that the private sector should play an active role in the waste management system of this city as they have a strong capacity in terms of financial and technical resources, to support the municipality toward sustainable development.[52]

Recently, a study on Hanoi's waste management system by Nguyen Huu Hoang and Csaba Fogarassy was published. In this paper, the authors made uses of comparative analysis, comparing four solid waste management enhancement alternatives, including "Improving the current system for waste collection and transportation"; "Reducing, reusing, and recycling waste at source"; "Mechanical–biological treatment (MBT) plants for classifying, composting, and refuse-derived fuel (RDF) for the cement industry"; and "MBT plants for classifying, composting, and RDF for waste-to-energy/incineration plants."[53] They came up with a conclusion that the Hanoi leadership should consider "MBT plants for classifying, composting, and RDF for waste-to-energy/incineration plants" ("mechanical–biological treatment facilities are applied to separate the household waste mechanically, as well as to classify the organic fraction for composing, and the refuse-derived fuel fraction for incineration in dedicated waste-to-energy plants")[54] as an excellent alternative sustainable solution for waste treatment[55]. It would be good if the methodology in this report could be used to analyze the situation and propose the leadership of each city/province in Vietnam.

This Thesis will try to address the issue mentioned above by covering a more extensive range of territory and offering more comprehensive solutions to the Vietnamese Government.

[51] R.L. Verma, G. Borongan, M. Memon, (2015), Municipal Solid Waste Management in Ho Chi Minh city, Vietnam, Current Practices and Future Recommendation, International Conference on Solid Waste Management
[52] R.L. Verma, G. Borongan, M. Memon, (2015), Municipal Solid Waste Management in Ho Chi Minh city, Vietnam, Current Practices and Future Recommendation, International Conference on Solid Waste Management
[53] Nguyen Huu Hoang and Csaba Fogarassy, (2020), Sustainability Evaluation of Municipal Solid Waste Management System for Hanoi – Why to Choose the "Waste to Energy" Concept
[54] Nguyen Huu Hoang and Csaba Fogarassy, (2020), Sustainability Evaluation of Municipal Solid Waste Management System for Hanoi – Why to Choose the "Waste to Energy" Concept
[55] Nguyen Huu Hoang and Csaba Fogarassy, (2020), Sustainability Evaluation of Municipal Solid Waste Management System for Hanoi – Why to Choose the "Waste to Energy" Concept

Literature review on waste management policies in ASEAN countries

There is a dearth of studies on the overall context of waste management in ASEAN countries, and most of these studies are dated. Since 1999, Ha Huong has already emphasized that environmental issues, including waste generation and disposal, have become a significant problem and top priority of policy agenda in most ASEAN countries.[56] Until now, waste treatment and management are still one of the heated topics of debate among ASEAN countries. However, few studies give readers a general overview of the current situation of ASEAN countries; instead, the studies are more focused on the situation and solutions for a specific country or city.

The most researched areas in the studies on waste management in ASEAN countries are the causes of the ineffective waste management system, consequences of waste mismanagement, and recommendations for the governments towards sustainable development. The leading causes of the weak waste management system in ASEAN are the same as those mentioned above in the literature on waste management in developing countries. Since the 1980s, many scholars have already argued that ASEAN countries have been experiencing the explosive growth of population, urbanization, industrialization, changes in lifestyle, and consumption behavior, which have increased not only the amount but also the type of waste.[57][58][59][60]

When looking at this situation, researchers have also pointed out that many cities in ASEAN countries could not handle and manage the increased amount of waste effectively due to lack of financial, human, and technical resources as well as an inadequate institutional and regulatory framework,[61][62] resulting in environmental degradation and risks for human health. One of the critical issues of waste mismanagement is waste segregation; however, in most ASEAN countries, the governments either do not have policies directing its citizens to segregate waste, or if they exist,

[56] Ha Huong, (1999), Environmental policies and natural resources management in Southeast Asia, Global Nest: the Int. J. Vol 1, No 3, 217-225.
[57] Ngoc, U. N., Schnitzer, H., (2009,. Sustainable solutions for solid waste management in Southeast Asian countries, Waste Management, 29,1982–1995
[58] N.W.A Lidula, N. Mithulananthan, W. Ongsakul, C. Widjaya, and R. Henson, (2006), ASEAN towards clean and sustainable energy: Potentials, utilization and barriers, Renewable Energy 32, 1441-1452.
[59] C. Curea, Chapter 15, Sustainable Societies and Municipal Solid Waste Management in Southeast Asia.
[60] Ha Huong, (1999), Environmental policies and natural resources management in Southeast Asia, Global Nest: the Int. J. Vol 1, No 3, 217-225
[61] Ngoc, U. N., Schnitzer, H., (2009). Sustainable solutions for solid waste management in Southeast Asian countries, Waste Management, 29,1982–1995
[62] C. Curea, Chapter 15, Sustainable Societies and Municipal Solid Waste Management in Southeast Asia

then they are not implemented effectively due to a multitude of reasons. Typically, solid wastes from all activities are often mixed and brought to the dumpsites without any treatment. In some ASEAN countries, they have environmental policies and new initiatives to be applied in wastes reduction; however, they lack financial resources for execution. The researchers also realized and concluded that open dumping and burning of mixed waste are preferred methods for waste treatment in almost ASEAN countries, and the 3R strategy (including reduce, reuse and recycle) seemed to be the only approach to manage waste back to the time of those studies' published date.

As in ASEAN countries, there are a lot of waste pickers/collectors, junk dealers (known as the informal sector) who play an essential role in the recycling industry. Therefore, integrating this informal sector into municipal waste management might become a solution for waste generation and help to extend the life cycle of products. In Iloilo City, the Philippines, recognizing the importance of the informal sector to the waste management process, the city's leadership formed an association named USWAG Calahuman Livelihood Association (UCLA), which could be considered as a cooperative for waste pickers/collectors. This association has 240 members and work together to recover waste materials. During its implementation process, the leadership of the city organized a lot of meetings, training, and workshops for waste pickers to enhance their capacity and awareness. Johannes G. Paul and his partners assessed this model. They concluded that this model provides new livelihood to the waste pickers/collectors as their income increases, some could earn even more than 5$ per day.[63] Besides, this model improves their working condition; they could work in a safer and less risky environment. To the community, UCLA helps to reduce and recycle the waste created; on the other hand, it raises people's awareness about waste segregation. It is also said that this initiative could be feasible to be employed in other cities if the municipal authorities pay enough attention and increase the investment in these projects.

The idea of considering waste as a source of opportunities and the informal sector as a key actor in waste management are also presented in a set of guidelines proposed by the United Nations Environment Programme (UNEP) in collaboration with the United Nations Institute for Training and Research in 2013. In this report, the authors illustrate this point with an impressive example from India. Waste collectors in Pune, India, who are mainly women, acknowledge the health risks

[63] Johannes G. Paul, Joan Acre-Jaque, Neil Ravena, Salome P. Villamor., (2012), Integration of the informal sector into municipal solid waste management in the Philippines – What does it need?

while picking and recycling waste. Therefore, they formed a union to organize their work and protect their rights. The establishment of this union brought a lot of benefits to women belonging to a low caste, widowed or deserted, such as minimizing their potential health risks as well as energy consumption and methane generation and increasing their incomes and recycling rates. The authors recommended some possible policy tools which can be applied in waste management strategy, including legislation and regulation, economic instruments (subsidies, taxes), educational programs and behavioral change, information and monitoring, and technology choice.[64]

Theoretical framework

The Thesis includes the theory of policy transfer by Dolowitz. According to Dolowitz (2003), "policy transfer is the process by which the policies and practices of one political system are fed into and utilized in the policy-making own political system."[65] The policy transfer, in general, is an intentional process of learning from the policy at an institutional setting or place A to use a copy or derivative of the policy at an institutional setting or place B. In this case, the prime goal of this Thesis is to find "best "waste management models in other ASEAN countries to be employed in Vietnam, supporting the Vietnamese Government to achieve its sustainable goal. Therefore, the author believes that this theory, together with its policy transfer framework developed by Dolowitz and Marsh (2000), could help the author to test some models (models will be chosen based on some criteria) and conclude.

To make it happen, the author will follow a set of seven questions in the Dolowitz and Marsh model to analyze and assess the models in the Vietnam context.

(i) Why do actors engage in this policy transfer? (this question is to specify the motivation of political actors when engaging in the policy transfer process: voluntary, coercive or mixture)[66]

(ii) Who is involved in the policy transfer process? (nine main categories of political actors: elected officials, political parties, bureaucrats/civil servants, pressure groups, policy entrepreneurs and experts, transnational corporations, think tanks, supra-national

[64] United Nations Environment Programme and United Nations Institute for Training and Research, (2013), Guidelines for National Waste Management Strategies: Moving from Challenges to Opportunities, 70-90
[65] Dolowitz, D. P. (2003), A Policy–maker's Guide to Policy Transfer. The Political Quarterly, 74: 101–108. doi:10.1111/1467-923X.t01-1-00517
[66] Dolowitz, D. P. (2003), A Policy–maker's Guide to Policy Transfer. The Political Quarterly, 74: 101–108. doi:10.1111/1467-923X.t01-1-00517

governmental and non-governmental institutions and consultants, identified by Dolowitz and Marsh)[67]

(iii) What is transferred? (eight categories: policy goals, policy content, policy instruments, policy programs, institutions, ideologies, ideas and attitudes and negative lessons, identified by Dolowitz and Marsh)[68]

(iv) From where are lessons drawn?

(v) What is the type of transfer? (This question is to help the author analyze which degree of transfer should be applied in the Vietnam context. There are four degrees of policy transfer, including "Emulation -transfer of the ideas behind the policy or program, Copying – direct and complete transfer, Combination – Mixtures of several different policies, and Inspiration – policy in another jurisdiction may inspire")[69]

(vi) What restricts/facilitates the transfer?

(vii) How is the process of policy transfer related to policy success or policy failure? (This question is to detect some factors leading the failure/success of the policy transfer. Three factors suggested by Dolowitz and Marsh which could lead to policy failure, including "uninformed transfer "(the policymakers have insufficient information about the policy and its implementation in originating country), "incomplete transfer "(main factors leading to the success of the policy are not transferred), and "inappropriate transfer "(the policymakers do not pay enough attention to the difference between the borrowing and the originating system)[70]

Below is a table of an initial assessment of comparing the theory and the Vietnam context based on seven questions.

[67] Dolowitz, David P. and Marsh, David (2000). "Learning from Abroad: The Role of Policy Transfer in Contemporary Policy-Making". Governance 13

[68] Dolowitz, D. P. (2003), A Policy–maker's Guide to Policy Transfer. The Political Quarterly, 74: 101–108. doi:10.1111/1467-923X.t01-1-00517

[69] Dolowitz, D. P. (2003), A Policy–maker's Guide to Policy Transfer. The Political Quarterly, 74: 101–108. doi:10.1111/1467-923X.t01-1-00517

[70] Dolowitz, D. P. (2003), A Policy–maker's Guide to Policy Transfer. The Political Quarterly, 74: 101–108. doi:10.1111/1467-923X.t01-1-00517

Table 1: Initial assessment based on Dolowitz and Marsh model

Why transfer?		**Who is involved?**		**What is transferred**		**From Where**		**Degree of transfer**		**Constraints on transfer**		**How to Demonstrate transfer**		**How transfer leads to Policy Failure**	
Theory – Model	**Vietnam context (expected)**	**Theory – Model**	**Vietnam context (expected)**	**Theory - Model**	**Vietnam context (expected)**	**Theory - Model**	**Vietnam context (expected)**	**Theory - Model**	**Vietnam context (expected)**	**Theory - Model**	**Vietnam context (expected)**	**Theory - Model**	**Vietnam context (expected)**	**Theory - Model**	**Vietnam context (expected)**
Voluntary/ Mixtures/ Coercive/	*Voluntary*	Elected officials	*National Assembly Members*	Policies (goals) (content) (instruments)	*?*	Within-a Nation/ Cross-National	*Cross-National*	Copying/ Emulation/ Mixtures/ Inspiration	?	Policy Complexity (Newspaper) (Magazine) (TV) (Radio)	*?*	Media	*Media*	Uniformed Transfer	*?*
		Civil servants	*Ministry of Environment and Natural Resources, Ministry of Construction*									Reports	*Reports*	Incomplete Transfer	*?*
		Institutions	*?*							Past Policy	*?*	Conference	*Conference*	Inappropriate Transfer	*?*
		Ideologies	*?*	Programs	*?*					Structural Institutional Feasibility	*?*	Meeting/ Visits	*Meeting*		
		Attitudes/ Cultural Values	*?*	Negative lessons	*?*					Language	*?*	Statement	*Statement*		

		Consultants Think tanks Transnational corporations Supra-national institutions	*UNEP, World Bank, etc.*									*Decree*		

Choosing the models

Choosing the models which form the basis of the author's policy recommendations will be carried out based on some criteria

(i) the effectiveness and the efficiency of those models when being implemented in certain countries

(ii) the similarity in social and economic conditions between countries applying those models and Vietnam

(iii) the potential of those models to be employed in Vietnam (finance, technology, human capacity).

Methodology

This Thesis uses a combination of archival, discourses-analytical, and qualitative methods.

First, the author uses the archival research methods, in which related books, journals, and reports will be utilized to build the sections of literature review and theoretical framework, ranging from existing literature on waste management in developing countries, ASEAN countries, and Vietnam. This method is the easiest to identify the research gap as we all stand on the shoulders of giants.

Second, regarding the discourse-analytical method, the author will analyze the discourses of ASEAN countries, which focus on Vietnam. The author will look at official documents and speeches from Vietnamese leaders and officials in detail. Particularly the government authorities that mainly take charge of waste management will be at the center of this method. National institutions and civil society will also be considered if applicable. This method is the most important one as political speech and official documents are the most accurate sources to evaluate and analyze the waste management policies. Furthermore, it is convincing evidence to measure the government's expectations-results gap. Some of the policy documents will be reviewed, such as:

- Decision No.807/QD-TTg approving the target programs of thermal treatment for facilities causing severe environmental issues in the period from 2016 to 2020.
- The National Strategy on Solid Waste Management to 2025, with a vision to 2050.
- Scheme strengthening domestic solid waste management capacity in Vietnam (prepared by the Ministry of Natural Resources and Environment).
- Decree 38/2015/NĐ-CP on waste and discarded materials management

- Law on Environmental Protection 2014 and Draft Amended and Supplemented Law on Environmental Protection 2020.
- Resolution 41/NQ of the Politburo on environmental protection in the period of industrialization and modernization.
- Resolution No. 09/NQ-CP of the Government on the regular meeting of the Government in January 2019

Last, the Thesis will use qualitative methods, including interviews and case study analysis. As for the interview, the author aims to interview the Vietnamese government officials or experts who directly involve in the policy planning, decision-making process, and implementation of the waste management policies. Besides, interviewing stakeholders who are involved in the performance of chosen models in other ASEAN countries will provide a more detailed and practical viewpoint of these models. Interviewees will be categorized based on some criteria and combined with the snowball techniques.

As for the case study analysis, the author chooses Vietnam as it is an interesting case. As mentioned above, to the best of the author's knowledge, there has been a lack of papers working on waste management in Vietnam at the national level recently. The author has lived in Vietnam for more than twenty years and has observed the way the Government has been managing wastes for years. This gives the author an opportunity to understand more about the waste management system in Vietnam. The Government of Vietnam puts a lot of pressure on the governmental authority to handle this issue for years; however, the situation is not improved. Most waste produced in Vietnam is going to open landfills instead of being recycled or reused. Not surprisingly, Vietnam is still among the top four countries which produce the most plastic waste in the world, with an amount of about 1.8 million tonnes per year[71], according to a World Bank report.

According to UNEP and the World Bank's assessment, Vietnam has comprehensive policies and programs in place for waste management; however, implementation mechanisms need to be evolved to achieve its sustainable development goal.

[71] http://quochoi.vn/hoatdongdbqh/Pages/home.aspx?ItemID=41630 Góc Nhìn Đại Biểu: Rác Thải – Tài Nguyên Hay Thảm Họa, (2019), http://quochoi.vn/hoatdongdbqh/Pages/home.aspx?ItemID=41630 (accessed on August 02, 2020)

Some of the policies are hardly implemented because of a lack of coordination between central and municipal agencies. For example, the Government, when issuing the National Strategy on Solid Waste Management to 2025, with a vision to 2050, aims that by 2025, Vietnam can collect, transport, and treat 90% of solid waste in urban areas and 80% in rural areas. 90-95% of closed landfills are renovated and reused. In this strategy, the Government also stated that solid wastes should be considered as a resource that can bring financial benefits to people. To implement this strategy, all the agencies from central to municipal need to collaborate well and mobilize all the resources to collect, transport, recycle and treat the solid waste as well as develop a road map of the costs for those waste collection, transportation, and treatment service which fit well for each municipality. However, after two years of implementation, all the agencies have been struggling with the process of collecting, transporting, treating, disposing, and recycling waste.

Some of the policies cannot be implemented due to a lack of finance and human resources. One of the key targets under Decision No.807/QD-TTg, dated July 03, 2018, is to tackle the environmental pollution of 30 unsanitary landfills. However, until now, according to Mr. Nguyen Thuong Hien, Deputy Director of the General Department of Environment, nothing has been done since then due to limited finance, technology, and human resources.

For the time being, the Government of Vietnam is drafting and receiving public comments for the revised Law on Environmental Protection. One of the top priorities of this Draft Revised Law is to address and overcome all the challenges causing the waste mismanagement in Vietnam. This paper hopefully could give the Government of Vietnam some policy recommendations regarding this issue.

Work plan

August 31, 2020

- Submit the Thesis report

From September to November 2020

- Choose the models in other ASEAN countries which could be applied in the Vietnam context
- Prepare and finalize the questions for interviews

- Finalize the lists of Vietnamese government officials or experts in the environmental sector for interviews and local people and officials who are involved in the performance of the models chosen in other ASEAN countries
- Contact the people on the list
- Arrange the interview via Zoom/Microsoft team

From December 2020 to February 2021

- Finalize the literature review, theoretical framework, and methodology parts
- Collect and analyze all the findings from the interviews
- Send the drafts of literature review, theoretical framework and methodology parts to supervisor (s) for review

From March 2021 to May 2021

- Revise the literature review, theoretical framework and methodology parts based on supervisor (s) 's feedback
- Write drafts of the models' assessment, the analysis of the interview findings
- Submit to the supervisor(s) for further feedback

From May 2021 to July 2021

- Finalize all the sections following the supervisor(s) 's feedback
- Follow the guidelines on the thesis's format
- Submit the Thesis