



LEARNING CASE
July 2019

Recycling Plastics in Asian City Environments (RePLACE)
**The General Situation on Plastic Pollution and Current Policy for
Plastic Pollution Mitigation in Vietnam**
A Case Study

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Abstract:

In developing countries, unplanned urban expansion often generates waste much faster than local authorities can collect and dispose of it, causing an emerging risk to both urban area's ecology and human health over the long term. This issue is particularly severe in regards to plastic waste, where disposal practices are often not environmentally friendly nor effective. For example, the management of plastic waste in urban areas within Vietnam is relatively ineffective, with a large proportion of plastic waste ending up unrecycled, eventually finding its way into the environment through various mediums. Within urban areas of Vietnam, the most common pathways for plastic waste to enter the environment are through indiscriminate littering and improper sorting, meaning much plastic waste ends up mixed with other wastes in landfills. Plastic waste that makes its way into marine environments also contributes to marine pollution through the leaching of chemicals contained in plastic into ocean water, threatening the feeding habits and life-cycles of marine wildlife. To propose an effective plastic mitigation program is a complicated endeavor and requires many insights into different fields of science and policy.

Learning objectives:

- To understand the relationship between the policy and plastic mitigation programs.
- To understand the importance of policy and its application on risk management and risk assessment projects for plastic pollution.

Subjects covered:

Plastic pollution mitigation policy; plastic pollution in city environments; risk management; risk assessment

Setting:

Vietnam

DISCLAIMER:

Every effort has been made to present accurate information for learning purposes. All information in this case study was cited from the announcements and policies of the Vietnam Ministry of Natural Resources and Environment, and other research on the same topic. RCE Southern Vietnam takes no responsibility for, and will not be liable for application of this case beyond the acceptable limits.

In many countries, especially developing countries, plastic separation is not properly coordinated during within waste management in general and during waste disposal practices in particular. Through many routes of translocation, a large portion of plastic waste will end up in landfills, where they will be mixed with other types of waste and buried.

With very low rates of decomposition, most plastic waste, including plastic bags, generates a great deal pollution in landfills and nearby areas, gradually causing bad impacts on the environment and society – both near the waste disposal site and further afield.

Currently, there are 3 main risks could emerge from the plastic pollution in city, including:

- The threat of plastic in landfills;
- The threat of plastic in rivers and oceans;
- The threat of plastic recycling

For cities in developing countries, with a low-level of capacity in relation to waste gathering and recycling, the biggest problem of plastic waste often originates from landfills. In general, waste separation in many cities in the developing world is too inefficient or simply not happening at all. This situation occurs because the profit coming from the sorting and recycling of plastic waste is often perceived as too low in comparison to the operating cost of sorting and recycling infrastructure for most companies and municipal government agencies in these cities. Improving the plastic pollution situation in developing cities will require trash collecting agencies to buy more gathering carts and trucks and employ more people to collect the separate waste – two things that many cities in developing countries currently cannot effort. As a result, almost all of the plastic waste generated by big cities in developing countries is simply being dumped into landfill sites across the country, where it is left unsorted and untreated.

Mixed plastic waste in landfills can cause many risks for both the environment and human health, which can be grouped into two main threats:

- Landfills reach their capacity to absorb waste after a short period of time, necessitating new landfills;

- Toxic chemicals are leached from plastics into the surrounding environment.

For each of these threats, many consequence risks may emerge and their impacts may vary depending on the situational context and location of different areas.

The potential risks from plastic in landfills are summarized in Table 1 below:

Risk from plastic in landfills	What can happen?	How and why?	Type of risk
Landfills overflow	Loss of lands for new landfills	Most plastic waste takes around 500 years to decompose. With the accumulation of plastic waste overtime, landfills will overflow, and new landfills must be established to replace the old ones.	Ecological risk
	Loss of lands used for old landfills	Landfills are not reused after closure due to technical or operational risks associated with these sites. Also plays into demand for land for construction of new landfills.	Ecological risk
	Reduced area for disposal of other types of waste	With plastic waste taking a greater percent of area of landfills, the removal of other types of urban waste (such as organic waste) will likely be slowed and even stopped in areas with overloaded landfills, causing higher risk of disease from exposure to this type of waste in urban settings.	Ecological and Human Health Risk
Toxic leachates from landfills	Toxic leachates from landfills may enter the soil and water table of the surrounding area	Plastic in landfills will ultimately decompose and release a wide variety of chemicals that may damage the surrounding ecosystem and impact human health in the area.	Ecological risk and Human health risk

Table 1. Potential risks from plastic in landfills

With an average GDP per capita growth of 6.4% a year since the 2000s, Vietnam has to deal with a high volume of plastic waste that is increasing every year due to increasing consumerism in its big cities. In all cities and towns of Vietnam, urban environmental companies have been established to collect and manage solid waste every day. But the efficiency of garbage collection and management is low, with rates ranging from 30-70% depending on the setting due to the large volume of waste generated daily⁵.

Any profit from sorting and recycling plastic waste is perceived as too low in comparison to the operating cost for most of these urban environmental companies to apply the practice. Improving the plastic pollution situation in big cities will require trash collecting agencies to buy more gathering carts and trucks and employ more people to collect and separate waste - two things most city governments currently can't afford. As the result, almost all of the plastic waste generated from big cities in the country is simply being dumped into landfill sites across the country, where it is left unsorted and untreated. It was reported in 2017 that 85% of the waste in Vietnam was being buried without treatment in landfill sites, and 80% of those landfills are unhygienic and polluting the environment⁷.

According to a previous United Nations report, Vietnam ranked 17th out of 109 countries for volume of plastic pollution produced in the world². According to statistics from Vietnam Ministry of Natural Resources and Environment, each Vietnamese household often discharges more than one plastic bag a day including big bags, small bags, and micro bags. In Hanoi and Ho Chi Minh City, about 80 tons of waste from plastic and nylon bags are created each day⁶.

Why Does the Problem of Plastic Waste Seem so Daunting for Cities in Vietnam?

One of the reasons plastic waste is gradually increasing in Vietnamese cities come stems from the public's lack of awareness on the topic. People often indiscriminately litter plastic waste on the street, on the surface or urban waterways, and in parks and green spaces within cities. Often times, this plastic waste is carried by water currents and/or wind to the ocean. In a context of increasing amounts plastic waste pollution, raising people's awareness in environmental issues related to plastic pollution is extremely essential in the Vietnamese urban context.

Another source of plastic pollution in Vietnam is the method for dealing with the plastic waste that is collected. Most of this waste ends up in landfills without any proper treatments or efforts to recycle the materials. The landfills in Vietnam are also overflowing, and more landfill sites are utilized often means the loss of resources and ecosystem services the land can provide. This is because the land used for landfills in Vietnam is not reused after the closure of a landfill due to technical or operational risks associated with the waste.

The recycling of plastic waste in Vietnam is also relatively under-developed. The rate of waste sorting at the source is very low, with almost all types of wastes put together and collected by local or city waste trucks. For example, in Ho Chi Minh City, about 250,000 tons of plastic waste is generated each year. Approximately 48,000 tons were buried in landfills (mostly low value plastics), accounting for 19.2% of total plastic generated; this leaves more than 200,000 tons of plastic waste that is recycled or disposed of directly into the environment⁶. According to the Department of Natural Resources and the Environment in 2018, Ho Chi Minh City has nearly 1,000 plastic and waste recycling facilities in operation, most of which are medium to small with old equipment and machinery that uses inefficient recycling technology⁵. According to the Vietnam News Agency, 94% of the city's recycling facilities do not have a wastewater treatment system and about 84% do not have a system for treating their emissions, causing serious environmental pollution just from the operation of these facilities⁸. Thus, Ho Chi Minh City faces the unfortunate situation where its plastic waste recycling facilities do little to improve the pollution issues related to plastic waste, but also contribute to pollution through their own industrial operation.

Another method Vietnamese cities and communities use to dispose of plastic waste is the use of incinerators to burn them for easier disposal. However, there are only about 50 solid waste incinerators in the whole Vietnam operating at any given time, most of which are small incinerators, with a capacity of less than 500 kg per hour⁵. The cost for developing modern and large-scale incinerators is simply too high with too great an energy demand for municipal governments to afford, to say nothing of the increased risks of air, water, and soil pollution inherent in the emissions generated in running such a facility. In general, aiming to solve the issues related to plastic waste by developing more landfills or incinerators is not considered a sustainable or long-term solution to plastic waste management for Vietnamese cities.

What are the Current Policies and Potential Mitigation Factors for Plastic Pollution in Vietnam?

From a report of the Vietnam General Department of Environment, the average volume of solid waste collected in Vietnam increased from 72% in 2004 to 80-82% in 2008 and 83-85% in 2010, leaving 15-17% volume of total solid waste available in the environment⁹. Up to 80% of collected solid wastes are buried in waste disposal site and landfills. However, 50% of solid waste burial sites are reported to be hazardous to

the environment⁷. Overall, the waste collection and treatment systems throughout Vietnam have not been well established. A good solution to this problem could be plastic recycling. Recycling can help to collect and treat plastic waste in an environmentally friendly way and this plastic waste could be converted into a profitable resource with the right technologies and incentive structure. Recycling of plastic waste also has great potential for conserving resources and reducing greenhouse gas emissions.

To promote a solution to the problem of plastic waste by recycling, in 2011 the Prime Minister of Vietnam approved the Solid Waste Investment Program for the period between 2011-2020, whereby 70% of total solid waste in rural areas must be collected and treated to ensure environmental hygiene, with 60% recycled for reuse. For urban areas, by 2015, 85% of the total volume of urban solid waste was to be collected and treated, with 60% recycled for reuse. The figures proposed will be 90% and 85% respectively by 2020 (Policy for plastic management and recycling number 582/QĐ-TTg, April 11, 2013 - see table 2).

While this is the right direction for solving the plastic pollution problem, the implementation of the policy in many aspects has not been synchronous and indeed inadequate. A big barrier to implementation has been the general psychology of the public, who continue to litter indiscriminately and choose not to engage in separating or classification of waste in households or small businesses. If the consumption of recycled products is encouraged, new recycling facilities can recover their investment fund and make a profit to promote new technologies in recycling.

The current laws, policies and legislation related to plastic management and plastic recycling in Vietnam are presented in Table 2. These policies mainly aim to develop an effective circulation of plastic from the generating sources to the destination of plastic waste, preventing plastic from escaping into terrestrial or marine environments.

Number	Policy and Legislation	Relevant contents
1292/QĐ-TTg, August 01, 2014	Action plan for the development of environmental and energy-saving industries to implement an industrialization strategy for Vietnam under the framework of Vietnam-Japan cooperation towards 2020 with a vision towards 2030.	Targets: 1) Build a plant to recycle plastic wastes into fuel oil or other products between 2015 and 2020. 2) Build a center for collecting and recycling expired transport vehicles. 3) Experiment with and develop a model for collecting and recycling electrical waste and electronic equipment. 4) Test and implement models for biodiesel production and for the production of other valuable products (DHA, alkaloids, antioxidants, etc.) from materials such as fish fat, animal fat, waste oils, nuts, jatropha, and oilseed.
1216/QĐ-TTg, September 05, 2012	National Environmental Protection Strategy for 2020, with a vision towards 2030	Missions: 1) Study, experiment, and apply on a large scale the collection of fees according to the volume and type of solid waste collected; Raise the fee rate step by step in order to fully cover the cost of solid waste collection, transportation, and burial of waste; Found a garbage market that can circulate, recycle, or reuse plastic waste and other types of solid waste. 2) Promote the application of an economical methodology for incorporating solid waste and in particular plastic waste management at the source; Set up a system of solid waste collection and reception centers which have been synchronously classified in public areas of both urban centers and rural residential areas. 3) Promote the socialization and formation of a network of enterprises, social organizations, and cooperation for collecting and transporting solid waste with definitive links in the network to recycling establishments and burial sites; Utilize network to step up the collection of solid waste for rural population quarters and public areas. 4) Elaborate and perfect policies and legislation on waste recycling to specify the activities of re-using and recycling waste and develop an environmentally friendly recycling industry. 5) Research, develop, and implement programs to develop waste recycling

		<p>capacity; Support the formation of large recycling enterprises on the basis of promoting the linking to every household and small production company to recycling facilities; Form concentrated industrial parks; Develop and receive the transfer of advanced recycling technologies, suitable to Vietnamese economic and resource conditions.</p> <p>6) Study and apply mechanisms and policies to support the crediting and pricing of recycled products; Establish and develop a market for clean, green, and environmentally friendly products.</p>
59/2007/NĐ-CP , April 09, 2007	Decree on solid waste management	Regulations on solid waste management and rights and obligations of entities involved in solid waste management.
58/2013/QĐ-TTg , April 11, 2013	A scheme to enhance environmental pollution prevention through the reduction in and use of biodegradable plastic bags in daily life up to 2020.	<p>Targets:</p> <p>1) By 2015, to collect and recycle 25% of plastic bag waste that is difficult to decompose.</p> <p>2) By 2020, 50% of the total amount of disposable plastic bag waste will be collected and recycled.</p> <p>Missions:</p> <p>1) To develop infrastructures and services for gathering and recycling plastics bags.</p> <p>2) To intensify the research and transfer of advanced technologies to recycle plastic bags which are difficult to decompose into useful and environmentally friendly products.</p> <p>3) To apply measures to sort wastes at the source, and collect and recycle plastics bags as one component of this waste.</p> <p>4) To encourage the use of recycled products made from plastic bag waste, especially in the construction of public works.</p>
798/2011/QĐ-TTg , May 25, 2011	Investment program on solid waste treatment in the period of 2011-2020	<p>Objectives: From 2016 to 2020</p> <p>1) 90% of the total volume of urban daily-life waste will be collected and treated to meet environmental standards, 85% of which will be recycled and re-used.</p> <p>2) 70% of the total volume of rural daily-life waste will be collected and treated to meet environmental standards, 60% of which will be recycled and re-used.</p> <p>3) 90% of total non-hazardous industrial solid waste will be collected and treated to meet environmental standards, 75% of which will be recycled and re-used.</p> <p>4) 90% of the total amount of hazardous industrial waste generated will be collected and treated to meet environmental standards.</p> <p>5) 100% of the total amount of non-hazardous and hazardous medical waste generated at medical establishments and hospitals will be collected and treated to meet environmental standards.</p>
2992/2011/QĐ-BCT , June 17, 2011	Vietnam plastics industry development up to 2020 with a vision towards 2025	<p>Plastic recycling projects: From 2011 to 2015</p> <p>1) Plastic recycling plant in Northern Vietnam: Vinaplast; Capacity: 100,000 tons (Completed in 2013).</p> <p>2) Plastic waste processing center in Southern Vietnam: Saigon Plastic Corporation SG Plastic JSC; Capacity: 150,000 tons (Completed in 2013).</p> <p>3) Plastic recycling plant in Southern Vietnam: Khánh Sơn solid waste treatment complex – Danang City. Capacity: 150,000 tons (Completed in 2015).</p> <p>Plastic recycling projects: From 2016 to 2020</p> <p>1) Plastic waste recycling plant (or expansion of existing factory) in Northern Vietnam: Capacity: 100,000 tons</p> <p>2) Plastic waste recycling plant (or expansion of existing factory) in Southern Vietnam: Capacity: 100,000 tons</p>

Table 2. Laws, policies and documents in Vietnam related to the management and recycling of plastic waste (From the report of VISTA, 2017)

Potential Technology to Replace Plastic in Vietnam

According to a survey from the Vietnam Recycling Fund in 2018, the Vietnamese public is still hesitant in regards to purchasing products made from recycled plastic. Consumers currently equate products made from recycled materials with poor quality and bad design¹⁰. Therefore, in order to support the output of recycled products in general and recycled plastics in particular, it is necessary to organize the certification process to ascertain the quality and origin of plastic in recycled products. In addition, the government should work to create and implement a mechanism to encourage people to use recycled products.

Besides promoting plastic recycling, one of the solutions to prevent plastic waste pollution is to replace some commonly used plastic products with products made from biodegradable materials. Through many researches and studies, the International Atomic Energy Agency (IAEA) is helping their member countries to make biodegradable plastics using plant and animal derived polymers. "Under the effect of radiation, chitin-chitosan (a polymer obtained from the shell of shrimp) is converted into a powder," said Agnes Safrany, a radiation chemist at the IAEA. "This powder is used to produce films and plastics that can decompose safely in the environment"⁴. Natural polymers are abundant, ranging from those found in the shells of crayfish and crabs, to seaweed, to cellulose in plants and yeast. This is an inexpensive, biodegradable and recyclable material. For more than 30 years, IAEA has been promoting the processing of natural polymeric irradiators in many countries. Under the influence of ionizing radiation, natural polymers change their chemical, physical and biological properties without being contaminated, thereby forming a safe, tough, transparent, and durable plastic with high potential for commercialization. In Vietnam, the usage of chitin and chitosan has already been implied in sprays and additives of many products for a while. For this reason, using chitin-chitosan as a replacement for plastic materials could be a potential solution for plastic pollution within the country in the future.

The Center for Plastic and Rubber Technology and Energy Management Training in Ho Chi Minh City and Multi-Beauty Company have recently introduced the MD-6060 biodegradable plastic material. The plastic products made from the material only take about 600 days to completely decompose. During the manufacturing of these plastic products, the material MD-6060 is required to be mixed with plastic (up to 10% total weight), resulting in a plastic material which automatically decomposes into CO₂ and water. The material is absorbed and degraded by microorganism and does not affect the environment by producing other harmful substances during decomposition. The results have been verified by the Hanoi Center for Quality Measurement¹. This material could be a potential replacement for the non-degradable plastic commonly used in plastic cutlery and bags.

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