Supported by

VCCI
Uniting Entrepreneurs

P4G
Partnering for Green Growth and the Global Goals 2030

# vietnam materials marketplace

June 2019

Vietnam Business Council for Sustainable Development

United States Business Council for Sustainable Development

pathway21

# TABLE OF CONTENTS

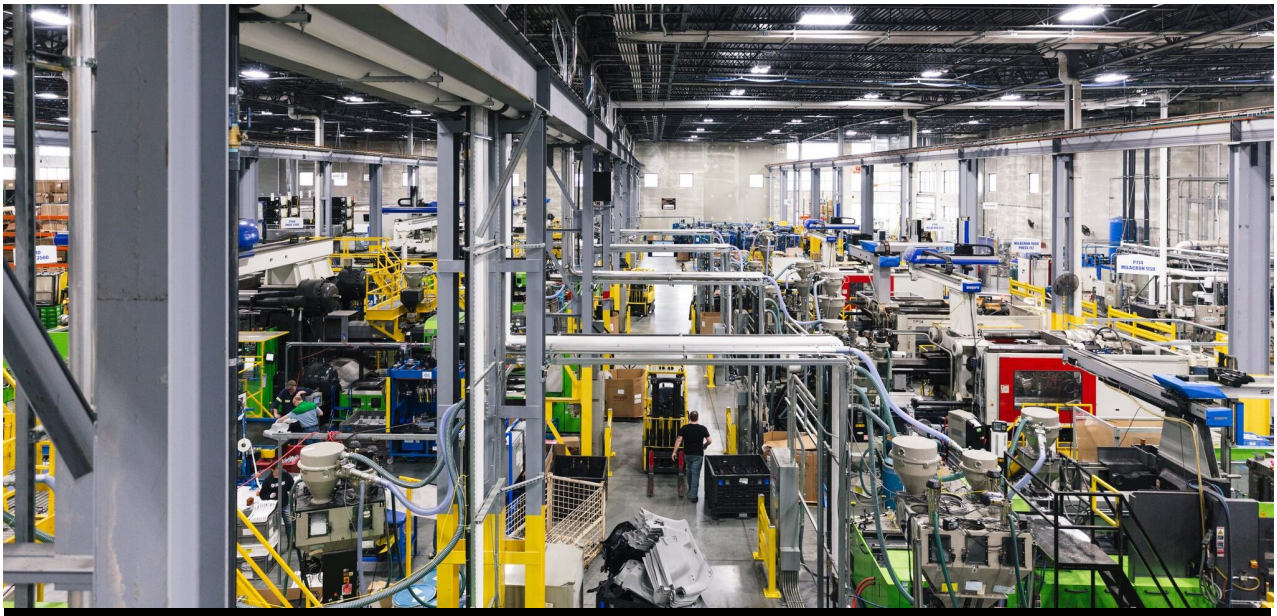
# LIST OF ABBREVIATIONS

| | |
|---|---|
| VMM | Vietnam Materials Marketplace |
| CE | Circular Economy |
| GoV | Government of Vietnam |
| PM | Prime Minster |
| MONRE | Ministry of Natural Resources and Environment |
| MOIT | Ministry of Industry and Trade |
| MOC | Ministry of Construction |
| MOF | Ministry of Finance |
| MOH | Ministry of Health |
| MPI | Ministry of Planning and Investment |
| GSO | General Statistic Organization |
| VCCI | Vietnam Chamber of Commerce and Industry |
| VBCSD | Vietnam Business Council for Sustainable Development |
| US BCSD | United State Business Council for Sustainable Development |
| DONRE | Department of Natural Resources and Environment |
| VEA | Vietnam Environment Administration |
| VPA | Vietnam Plastic Association |
| VPPA | Vietnam Pulp and Paper Association |
| P4G | Partnering for Green Growth and the Global Goals 2030 |
| URENCO | Urban Environment Company |
| NGO | Non-governmental organization |
| LEP | Law on Environmental Protection |
| HS | Harmonized System Codes |
| FTA | Free Trade Agreement |
| ASEAN | Association of South East Asia Nations |
| JICA | Japan International Cooperation Agency |
| MSW | Municipal Solid Wastes |
| FDI | Foreign Direct Investment |
| QCVN | Vietnamese Standards |
| VND | Vietnamese Dong |
| VAT | Value-added Tax |
| PET | Polyethylene Terephthalate |
| rPET | Recycled PET |
| PP | Polypropylene |
| PVC | Polyvinylclorua |
| PE | Polyethylene |
| HDPE | High Density Polyethylene |

| | |
|---|---|
| LDPE | Low Density Polyethylene |
| BCTMP | Bleaching Chemical Thermo- Mechanical Pulp |
| BSKP | Bleached Softwood Kraft Pulp |
| UKP | Unbleached Kraft Pulp |

# LIST OF FIGURES

# LIST OF TABLES



# EXECUTIVE SUMMARY

## Project background, objectives and importance to Vietnam

Eliminating waste from the industrial supply web by reusing materials to the maximum extent possible promises production cost savings and less resource dependence. The benefits of a *circular economy* are not merely operational but strategic, not just for industry but also for customers, serving as sources of both efficiency and innovation. And its implementation unlocks a wealth of previously unavailable data on material flows. The data, which brings companies and governments together to identify economically and environmentally beneficial opportunities, is a key component of this project.

The overarching objective of this partnership is to speed the shift to a circular economy in Vietnam by transforming the way manufacturers and processing companies source, value and manage materials. Driving this process is the *Vietnam Materials Marketplace*, a collaboration and implementation platform where participants can track, identify, qualify and execute by-product material reuse.

The founders of the partnership – the Vietnam Business Council for Sustainable Development (VBCSD), the Vietnam Chamber of Commerce and Industry (VCCI), the United States Business Council for Sustainable Development (US BCSD) and Pathway21, a United States developer of cloud-based reusable materials

marketplaces for industry – used P4G startup funding to research, evaluate and map specific gaps in the Vietnam waste, reuse and recycling ecosystem to inform the design and configuration of the Vietnam Materials Marketplace. It is important to identify these regional gaps and stakeholder value propositions because the ability to solve operational, environmental, and economic problems will drive participation in the marketplace.

Solid waste management is a long-standing priority in Vietnam, and in 2018 the Government of Vietnam added the goal of establishing a circular economy as a national objective in Decision No.491/2018/QD-TTg on integrated solid waste management strategy to 2025 and orientation to 2030. Urbanization, as well as strong economic and population growth, are rapidly increasing waste volumes, with waste generation in Vietnam doubling in less than 15 years[1]. The government's National Strategy on Integrated Management of Solid Waste 2020 - 2050 seeks collection of 100% of urban solid waste, including targets for separating and recycling. These targets will be difficult to meet. With only 30% of the country's 660 waste disposal sites classified as engineered sanitary landfills, waste disposal is causing serious land and water pollution as well as adverse human health impacts.

Contributing to Vietnam's waste challenge is the country's booming economy, driven by a rapidly expanding manufacturing sector. Manufacturing production rose 14.4% in 2017, and the related volume of solid waste discharged annually by industrial parks is expected to grow 30 to 40% by 2020. On the production side, manufacturers are unable to source certain raw materials from within Vietnam and are increasingly importing supplies. Our research led us to focus on paper and plastics as the most immediately challenging material flows in Vietnam, representing both market opportunities and environmental obstacles.

The Vietnam plastic sector discharges an estimated three million tons per year into the environment, including 0.28-0.73 million tons/year (Jenna Jamberg report[2]) that end up in the ocean. Of these plastic flows, 0.7-1.0 million tons are being recycled back into production, another 1.3 million tons are sent to waste treatment and disposal facilities, most of which are not classified as engineered. Both paper and plastic industries depend heavily on imported scrap to meet the needs of their customers, while the country struggles to adequately recycle comparable materials from the domestic market. But even with a 100 percent capture of domestic paper and plastic scrap the country would still need to import large volumes to meet the needs of the paper and plastic industries, requiring establishment of an efficient material import system that covers environmental as well as market needs.

[1] Solid and Industrial Hazardous Waste Management Assessment, KGGTF

[2] Jenna R. Jambeck et al.,Plastic waste inputs from land into the ocean

We have learned that companies and policy makers in Vietnam want to transform waste to value, but they struggle to make connections, especially across industries, material types and districts. It is difficult to get data needed for decision-making and companies lack the tools to identify, qualify, and track reuse opportunities. Government ministries struggle to know what materials should be allowed into the country to support manufacturers needs and which to reject as waste being dumped on the country. A scalable, multi-sided platform for material reuse is needed to address these challenges and enable a circular economy that will create jobs and new sources of revenue.

Without data on the flow of paper and plastics in Vietnam, companies and policy makers have real challenges knowing where to invest, commit resources, and how best to enact or enforce policies. The data collected by the VCCI/VBCSD owned and operated Vietnam Materials Marketplace platform, will drive plastic and paper waste up the value chain in their highest and best use, reducing environmental impact and using circular economy principles to grow Vietnam's economy in a sustainable and resilient way.

## Activities Undertaken by the Partnership

A number of activities have been conducted to support the overall objective of developing a Vietnam Materials Marketplace:

- Developing a framework and contents for the study;
- Performing desk review on Vietnamese paper and plastics sectors;
- Conducting research with 312 stakeholders in the country that consume, produce and provide waste service, and 11 stakeholders from Government and NGOs in the plastic and paper sectors.
- Developing an implementation approach that emphasizes local leadership and program ownership and a funding strategy that provides time for maturity of the value proposition for all stakeholders;
- Identifying market opportunities and obstacles for paper and plastic material reuse domestically and for import;
- Organizing workshops with relevant stakeholders to present and discuss the initial findings and potential path forward;
- Scheduling a November 2019 Circular Economy Summit in Vietnam to present the nation's Circular Economy strategy, including the Vietnam Materials Marketplace.

## Based on these activities, the partnership has reached the following key findings:

- Markets
    - Domestic supplies of paper and plastics are falling dramatically short of meeting the needs of the Vietnamese private sector and this gap is projected to grow as the economy grows;
    - Manufacturers are currently unable to source enough quality materials domestically or internationally to meet their needs;
    - Recently established regulations aimed at preventing the import of waste streams have had the unintended consequence of blocking viable materials from reaching manufacturers;
        i. Pulp and paper manufacturers, numbering more than 150 nationally, are urgently seeking quality-verified sources of fiber to import in order to meet the needs of their customers totaling nearly 200,000 tons per month;
        ii. Domestically, plastic materials for industrial use (including primary and recycled) meet only *20% of the demand*; 80% of input materials for manufacture is imported. Projections do not show current effort bridging that gap. By 2025, Vietnam can provide up to 4 million ton of original resin (if all investment projects come into operation as planned) while the demand in 2018 was already 5.9 million tons. In 2018, 8.3 million tons of plastic products were produced from 6.9 million tons of resins and around 1.4 million tons of recycled plastic scrap.
    - Materials Marketplace survey results:
        i. 74% of those surveyed were positive about the development of a material marketplace;
        ii. 37% of respondents expressed interest in engaging with the marketplace;
        iii. The rates from respondents from the plastic sector (83% and 49%) are higher than that from the paper sector (72% and 37%). Except for high interest from large producers (77%) in the material market, the interest of respondents is unrelated to the size of operation;
        iv. 7% of respondents, equally from consumers and producers, confirmed that they have required and/or received requirements on ratio of recycled materials in their plastic products.

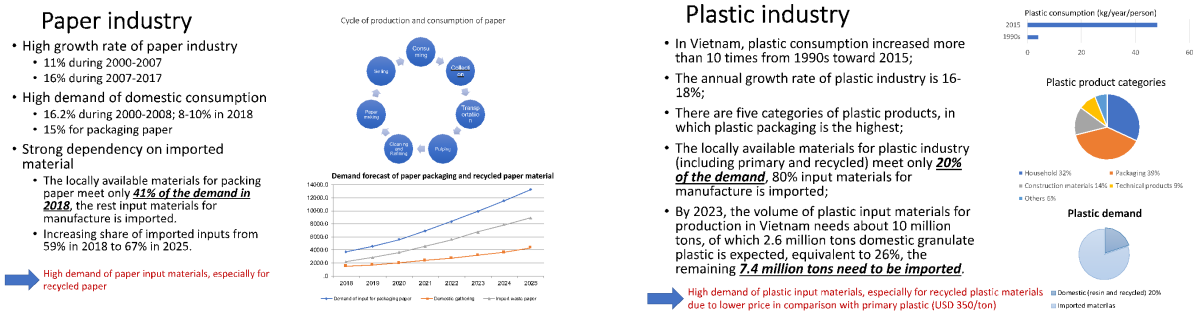



***Figure 1. Overview of Plastic and Paper Industries in Vietnam***

- Government
  - A disconnect exists between economic realities and environmental regulations for paper and plastics reuse;
    - Current regulations are based on treatment of scrap material as waste and a possible source of pollution;
    - Secondary processors, recyclers and some manufacturers see it as an important source material;
    - This disconnect causes parties to seek ways to go around regulations and is a root cause of pollution and risk to human health;
    - Vietnam has a legal framework for environmental management, but it lacks effective connection to industry and real data that would drive results;
    - The Ministry of Natural Resources and Environment (MONRE) and the Ministry of Industry and Trade (MOIT) have overlapping authorities and objectives on scrap and waste that are not aligned;
    - Although national government entities develop regulations, it is often the district-level government agencies that determine level of enforcement;
    - In response to China's ban on importing waste and scrap in January 2018, MONRE established a September 2018 regulation requiring imported scrap to be examined and verified before being allowed into the country for use;
    - This import restriction has produced a backup of several months at Vietnamese ports of entry with containers sitting awaiting inspection due to a shortage of inspectors and no modern tracking and tracing capability for materials coming into Vietnamese ports;
    - Regulatory changes will soon limit import of scrap only by companies that directly manufacture a final product, excluding

importers; enterprises seeking to use recycled plastic will be forced to establish their own brokerage capability, putting exceptional strain on small and medium sized companies;

- Mixed paper will be de-authorized for import in pending regulations; in 2018, 37% of total scrap paper imports were mixed paper and were used by 37 Vietnamese manufacturers
- The Environment Ministry continues to adapt and change its waste and scrap regulations in attempts to address the disconnect, most recently in 2019[3],
- Policies clamping down on imports aimed at protecting the environment and making strong international statements are not coupled with guidance or resources relative to data collection and policy enforcement that will lead to investment in proper handling, separation and disposal of materials already in-country.

- Waste Management
  - Solid Waste Management is a public and government priority, yet there is very little data available on current practices to drive improvement efforts;
  - Most waste is disposed of in insufficiently designed and poorly controlled landfills causing significant environmental problems;
  - Vietnam needs to start a phased approach of gradual improvements to its solid waste management; it will be more difficult l to leapfrog from the existing simple system and very low-cost recovery levels into advanced modern and expensive solid waste management systems;
  - Without adequate planning for needed regulations and monitoring processes it will be more difficult to enact and enforce the controls necessary to curb pollution while balancing the economic needs of a growing manufacturing base;
  - The institutional and regulatory framework for waste collection, treatment and disposal and planning of waste infrastructure are

[3] ***Circular No.01/2019/TT-BTNMT*** from March 8, 2019 of MONRE regulating the suspension of enforcement of some provisions of Circular No.08/2018/TT-BTNMT and Circular No.09/2018/TT-BTNMT of MONRE promulgates national technical regulations on environment. Accordingly, the Circular regulates to stop enforcing some provisions to shorten the clearance time for a business.

***Resolution No.09/2019/NQ-CP*** from February 3, 2019 of the Prime Minister from the Government meeting No.1, chapter on management of import and use of imported scrap as production materials. This assigned MONRE to be in charge of state management of solid waste and requested MONRE to review, complete, supplement, develop legal documents on environmental protection in importing scrap for production purposes. Particularly for plastic scrap, it is allowed to import as raw materials for the production of plastic sticks only by December 31, 2024.

***Government's Decree No.40/2019/ND-CP*** from May 13, 2019 on amending and supplementing several articles of regulations of LEP (Decree 40). The Decree amends and supplements a number of Decrees including Decree No. 38/2015/ND-CP on managing waste and scrap. Decree 40 approves supplementing list of 3 groups of industrial production types with risk of environment pollution**.** Treating, recycling waste, using imported scrap to make material for production is under the group 2. In compliance with new regulation, scrap imported to make production material must satisfy regulation at Clause 1, Article 76 of LEP. On the Conditions for import of organizations and individuals, Decree 40 indicates that organizations, individuals which have facilities using imported scrap must meet requirements before importing scrap to make production material

insufficiently prepared for more expensive waste treatment and private sector participation;
    - A Materials Marketplace can help organize data on industrial flows and begin making connections with reuse opportunities in the near term, helping to drive the linear waste flows toward circular productive reuse.

- Recycling
    - Recycling is rudimentary and dominated by the informal sector, causing substantial environmental problems in the craft villages where recycling takes place. In addition, there is significant illegal discharge of waste due to low public awareness;
    - The source of domestic plastic scraps collected does not meet the actual demand. The Vietnam Plastics Association (VPA) has proposed amending some contents of the plastic scrap import list in Decision 73/2014/QD-TTg and QCVN 32:2010 and setting up the "Recycling Environment Fund" from contributions by enterprises involved in scrap recycling activities. Charges are from VND 50,000 to VND 100,000 per ton of raw material calculated on the basis of the import volume. It is expected that the fund will process from VND 500 to 1000 billion per year. This fund will be used for the construction of wastewater treatment plants for plastic recycling craft villages, raising awareness and support waste sorting at source, destruction of unqualified imported scrap lots, inspection for compliance of environmental legislation in recycling plants;
    - Plastic reduction, recycling and alternative policies are considered government priorities as they can reduce the generated waste and leakage of such waste into the environment, rivers and the ocean.

## Recommendations

Establishing a materials marketplace and putting it to work in Vietnam is the right approach to managing the current environmental pollution from one side and promoting the circular economy from other side. To do this, several actions are recommended for action.

1. *Present details of regulatory and manufacturing disconnections and opportunities to the VCCI/VBCSD Circular Economy Advisory Committee and work through solutions to protect the environment while allowing viable materials needed by manufacturing into Vietnam.*
2. *Establish a localized Materials Marketplace platform implementation as a central data collection and tracking system for government and business sectors.*

3. *Establish an innovation center or innovation zones using material data gathered from the identified by-product streams and fueled by internal/external investment. It would provide an opportunity for regulatory flexibility and technology proof-of-concept while generating valuable material for outreach and education.*
4. *Establish better tracking and verification systems to allow for smooth flow of materials through Vietnam's ports.*
5. *Use the VCCI/VBCSD November 2019 Sustainability Summit to move commitments to implementation.*

## Support

**Government**

- Establishing a circular economy in Vietnam is a government priority: in May 2019 Prime Minister Nguyen Xuan Phuc added the goal of establishing a circular economy model as a national objective in the Directive No.13 on Sustainable Development. The need of building circular economy was repeated in the Prime Minister's message at the National Launching Ceremony against Plastic Waste in June 2019;
- In April 2019, Vietnam Prime Minister Nguyen Xuan Phuc issued a Guiding No. 161/LDCP to all government agencies, the private sector and the public focusing on dealing with plastic waste, building and scaling up good models, propose initiatives and actively participate in specific actions like changing habits, reducing, sorting, collecting, reusing, recycling plastic waste, and promoting the circular economy and green growth;
- According to the need of building socio-economic development strategy in the period 2021 – 2030, compatible with implementation of sustainable goals and responding to climate change, a working group on circular economy was established and led by the Minister of MONRE. The working group will make a proposal focusing on promoting circular economy in Vietnam, submit to the Party in order to integrate into socio-economic development strategy, in which secondary marketplace is an important element for the success of the model;
- MONRE, which is in charge of waste management, is amending the Law on Environmental Protection to make more favorable conditions for waste management and transaction.

**Corporate Support**

- Support is being sought from Circulate Capital, a newly formed $100 million impact investment management firm dedicated to financing innovation, companies, and infrastructure that prevent the flow of plastic waste into the world's ocean while advancing the circular economy. Companies investing in

Circulate Capital include PepsiCo, Coca-Cola, Dow Chemical, Unilever, all of which are VCCI members;

- VCCI/VBCSD member support details: Unilever Vietnam and Dow Chemical Vietnam are two first companies who are interested in VMM for their own projects on Post Consumer Recycling and Alphas Road.
- VCCI/VBCSD commitment to the VMM as a key component of its strategy:
    - VCCI's action plan submitted to the Government responding to the Resolution No.02/NQ-CP on improvement of business environment and competitiveness of Vietnamese Government dated January 1st 2019;
    - VCCI's action plan submitted to the Government responding to the Directive No.13 on Sustainable Development of Prime Minister dated May 20th 2019;
    - Building secondary materials marketplace is a strong recommendation of VCCI which need to be included in circular economy proposal of MONRE submitted to the Party for socio-economy development strategy in the period 2021 – 2030;
    - Circular economy is a key session at the annual Conference on Sustainable Development which has been co-organized since 2018 by the National Council for Sustainable Development and Competitiveness Improvement, VCCI and the World Bank in Vietnam.

# Introduction

## 1.1. Circular Economy background and global context

Moving towards a more circular economy is a way to use fewer natural resources, reduce pollution, tackle climate change, and enhance consumer satisfaction, while also improving the bottom line. The rational path, however, is not always the path of least resistance. In an economy where disposability and linear throughput reigns, shifting the system will take leadership, collaboration, innovation and commitment. From plastics, to electronics, to food and fashion, incremental steps are being taken to drive more circularity into material value chains. It is time to accelerate that progress.

The quest for a substantial improvement in resource performance across the economy has led businesses to explore ways to reuse products or their components and restore more of their precious material, energy and labor inputs. A circular economy is an industrial system that is restorative or regenerative by intention and design. The economic benefit of transitioning to this new business model is estimated at more than one trillion dollars in material savings globally.

Eliminating waste from the industrial supply web by reusing materials to the maximum extent possible will cut costs and reduce reliance on resources. However,

the benefits of a circular economy are not merely operational but strategic, both for industry and for customers. Economies will benefit from substantial net material savings, mitigation of volatility and supply risks, drivers for innovation and job creation, and improved land productivity and soil health.

## 1.2. Objectives and scope of the study

The Vietnam Business Council for Sustainable Development (VBCSD) of VCCI completed the *"Study and survey on willingness of Vietnamese authorities and enterprises of the plastic and paper industries in participating in a circular economy model, set up a database for market preparation on secondary materials of these two industrial sectors"* in order to step by step develop a market for secondary materials as part of a circular economy model in Vietnam. These study and survey activities are conducted under the framework of VBCSD's working plan in 2018 and a joint project between VBCSD and the United State Business Council for Sustainable Development (US BCSD) on Development of Vietnam Market on Secondary Materials, sponsored by initiatives at the summit of Partnering for Green Growth and the Global Goals 2030 (P4G).

This Research Project aims to address three objectives:

- To review legal framework, assess the role of the authorities and recommend on the deployment of a circular economy model in the plastic and paper industries.
- To assess the willingness of stakeholders, including buyers, sellers of recycled plastic and paper materials and supporting service providers, to participate in a circular economy materials marketplace program;
- To establish an initial database of buyers, sellers and supporting service providers for further development on a secondary materials market of the two industrial sectors.

This study and survey were conducted by EPRO Consulting JSC with the plastic and paper sectors in the form of desk study, questionnaire survey (312 samples from 103 consumers, 171 producers, 69 waste service providers, amongst them 29 have more than one role in material flow) and face to face interviews (14 face-to-face interviews, of which 2 were waste service providers, 6-producers, 1-product users and 3-business association representatives, NGO and 2-governmental authorities). The desk study and survey showed 10 provinces with highest number of medium and large enterprises that expressed their interest in the material market in the following order: Hochiminh City, Dong Nai, Binh Duong, Hanoi, Hai Phong, Hung Yen, Long An, Bac Ninh, Phu Tho and Thanh Hoa.

## 1.3. Plastic and Paper Material Flows in Vietnam

### 1.3.1. National policy context

Vietnam plastic and paper material flow is mainly under management of two ministries – the Ministry of Industry and Trade (MOIT) and the Ministry of Natural Resources and Environment (MONRE). MOIT is responsible for performing state management functions related to plastic and paper industry and trade development. MOIT has been assigned the task of management of production and quality for the business of these sectors. MONRE has responsibility for environment management and governance, including the environmental performance of all players. Institutional regulatory frameworks for environmental protection and waste management have, in general, been well established in Vietnam, but not in the case of the scrap specifically. While MONRE sees scrap as a waste, waste service providers and producers consider it as materials/inputs for their production. Vietnam allows the import of scrap only for final production. These scrap materials are mainly post-use waste from other countries. Importing of scrap is becoming a challenge for the Government of Vietnam (GoV) to control due to complexity in types and high volumes of scrap from the international market.

The following paragraph presents the legislation framework relating to waste circulation.

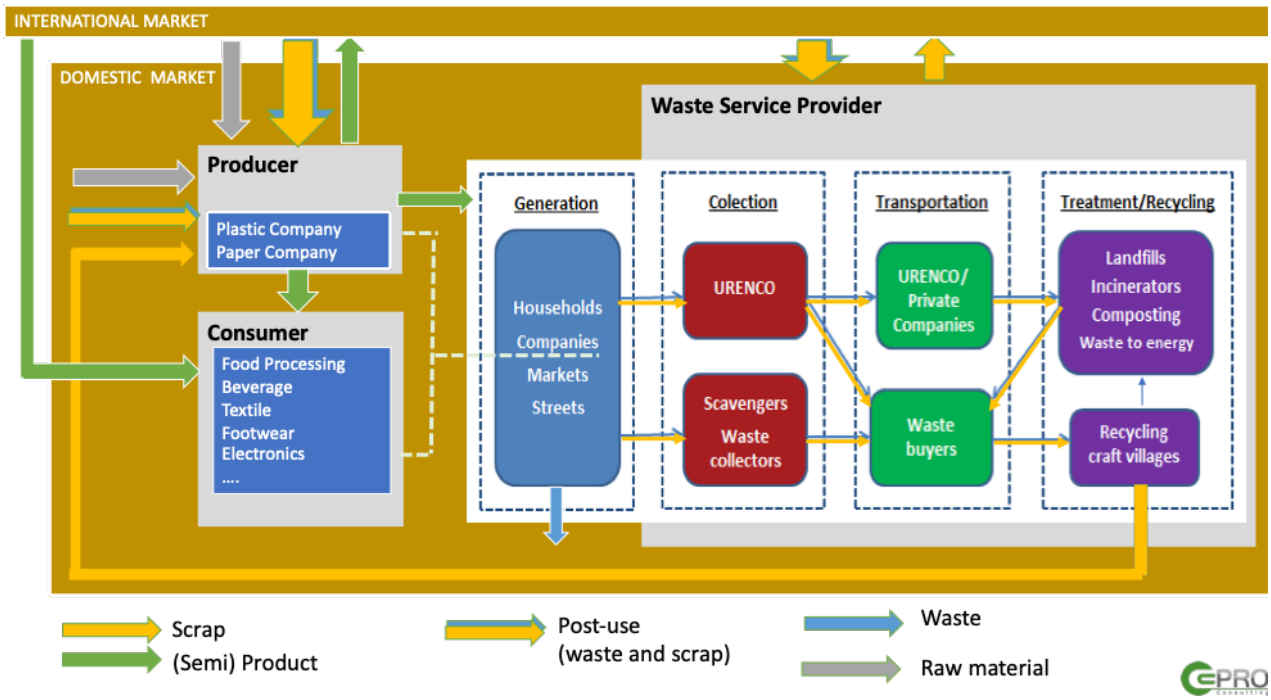



***Figure 2. Overview of material flow in Vietnam plastic and paper sectors***

In Vietnam, there are three main levels of environmental legislation: (i) The National Law on Environmental Protection (LEP) 1993, amended in 2005 and 2014 and under revision in 2019, (ii) Regulatory instruments issued by the national government, and (iii) regulatory instruments issued by ministries and provincial governments.

- The basic legal framework for environmental protection in Vietnam is the Law on Environmental Protection (LEP), which was adopted by the National Assembly in late 1993 and took effect in January 1994. The LEP stipulates a separate chapter on environmental protection in manufacturing, trading and service provision (chapter 7) and on waste management (chapter 9) with an Article 76 on Environmental protection during import of scrap. With regards to waste management, there have been in LEP definitions on different terms on waste such as waste, scraps, discarded products, waste management and waste reuse, recycling etc. However, it has been observed that there is no clear distinction between waste and scrap in Vietnam as usually defined in other countries. For scrap, the current LEP identified that import scrap from other country to Vietnam must comply with environmental regulations and listed under the imported items regulated by Prime Minister.
- The second group of legislation consists of regulatory instruments issued by the government, such as decrees, decisions and regulations. They provide instructions on how to implement as well as operationalize the LEP.
    - The Decree No.38/2015/ND-CP is the most important regulation for waste and scrap management. This Decree has no further guidance on scrap management except importing scrap for production. The Decree stipulates that: (i) only organization or individuals directly using scraps as production raw materials and/or (ii) undertaking the entrusted import of scraps for organizations or individuals using imported scraps as production raw materials can import scraps. This clause is being considered to narrow down to only organizations and individuals with actual production, i.e. the entrusted entity is planned not to be eligible for importing scrap.
    - Decision 73/2014/QD-TTg provides a list of 36 scrap categories to import, mainly for plastic, glass, paper and steel production. The list includes 7 categories for plastic scraps with HS code of 3915 and 4 categories for paper scraps with HS code is 4707. The Government is reviewing and planning to ban import of mixed paper scrap with HS code 4707900. From June 2017 to June 2018, around 780,000 tons of mixed scraps was imported to Vietnam by 13 paper companies, accounted for 37% of total import scrap in 2018.
    - Incentives are provided under Circular Number 121/2008/TT-BTC for land use, tax, R&D and training. More than that, the public procurement is encouraged to prioritize recycled products under Decree 19/2015/ND-CP. Vietnam has many orientation policies to support

waste circulation. This includes Master plan for regional solid waste treatment (in northern, central and southern Vietnam, 2009), Development of environmental industry to 2015 and vision to 2050 (2009), Development of mechanism to support investment in environmental protection (2009), National strategy on solid waste management to 2025 and vision to 2030 (2012) etc. However, the impact of these policies are unknown.

- The third group of legislation comprises regulatory instruments issued by ministries and provincial governments, such as standards, regulations, rules, directives and circulars. The scrap importers need to comply with environmental requirements under ***Circular Number 41/2015/TT-BVMT***[4]. According to this circular, the importer must present a certificate for meeting importing conditions on environmental protection, sample-testing results granted by the conformity certification organization named on the list of those designated by the MONRE and a certificate for compliance to quality requirements (less than 2% impurities, less than 20% humidity…). ***Circular No.08/2018/TT-BTNMT***[5] promulgated technical standards for imported plastic scrap (***QCVN32:2018/BTNMT***) and paper scraps (***QCVN33:2018/BTNMT***) and procedure for testing and certification. However, due to its complicated requirements in logistics (checked by four authorities, including DONRE from location of importer), this contributed to the blocking of 21,591 containers at ports. The ***Circular Number 01/2019/TT-BTNMT***[6] simplified requirements on logistics on 8 March 2019. In August 2018, six staff members of two service companies were arrested for faking paper to import 10,000 containers. The Prime Minister issued ***Directive Number 27/CT-TTg***[7] to stop granting new or renewed certificates for entrusted entities in importing scrap and requested MONRE to shorten the list of scrap to import. Right after this, MOIT issued Directive 06/CT-BCT to its provincial Department and ***Circular 41/2018/QC-BCT*** [8]regulating list of scrap categories to be terminated with trading, import and re-export. While the plastic scrap is not regulated under this decision, it is effective with paper scrap. The ban on importing plastic scrap by 2024 was regulated under ***Directive Number 2227/VPCP-KTTH*** on importing scrap at ports.

---

[4] Circular Number 41/2015/TT-BTNMT dated 9 September 2015 on environmental protection in importing scrap as materials for production

[5] Circular No.08/2018/TT-BTNMT dated 14 September 2018 of MONRE on promulgating national technical standards on environment

6 Circular Number 01/2019/TT-BTNMT dated 8 March 2019 on deactivate some regulation under Circular 08/2018/TT-BTNMT

7 Directive 27/CT-TTg dated 17 September 2018 on urgent measures to strengthen management on import and usage of scrap as materials for production

[8] Circular 41/2018/TT-BCT dated 6 November 2018 on regulating list of scrap categories to be temporally terminated with trading, import and re-export

In general, policies are aimed at environmental protection. However, the policy and regulatory system in Vietnam lacks a robust framework to support recycling activities or mechanisms to promote the segregation of waste at the source, key to any sustainable waste-to-resource approach. Moreover, there is no clear distinction between waste and scrap***. The effectiveness of monitoring and enforcement is not known.***

Vietnam is revising the Law on Environmental Protection in 2019. Among the topics for revision are the distinctions between waste and scrap. In order to avoid being a waste dumping site of the world, the ***national policy framework will be revised*** with more strict conditions and guidance on importing of scrap as materials for production.

Under the two studied sectors, the categories of paper scrap to import for production will be narrowed by removing some categories. The import of plastic scrap for production will not be allowed after December of 2024. It is also noted that the entrusted importer of scrap will no longer be eligible to perform, but only waste service producers.

The legal framework for waste and scrap recycling is developing to support national resources with strict conditions from international resources. ***Waste and scrap flow in the plastic sector will remain within the domestic market while that of the paper sector will continue with the international market with more strict conditions. The number of intermediate to international markets will be reduced.***

While the legislation at the central level is opened for scrap collection, transportation and treatment, the local authority has developed provincial and regional waste management plans with strict control and permission for waste flow from other provinces. ***Without a clear revision of the legal framework to support circulation of waste and scrap, flows may be impacted by cross province business, which is currently different from one province to others.***

---

*There will probably be changes, especially when the economy is shifting towards a circular economic trend. In order to step by step formulate and develop a circular economy, the Government has recently had tax incentives, capital and land support to build waste recycling facilities. Vietnam aims for a circular economy in the industrial sector, including processing and reusing industrial waste as the input material for cement production, construction materials, paper production...*

*In particular, the Law on Environmental Protection has encouraged the recovery, process and recycle of post-production waste. Along with that, the green growth strategy in 2012 and Vietnam's renewable energy development strategy to 2030 vision of 2050 is also the ambition of Vietnam to change community awareness in the issue of waste circulation. However, I find that we still lack specific regulations and guidelines from the state so it is difficult to implement. Only the amount of waste generated is growing in Vietnam, but the ability to collect and reuse is not commensurate, especially Vietnam has not yet classified waste from sources due to lack of technology and resources ... also shows that it will take a long time for us to keep up with the world.*

*Therefore, the government plays a very important role in promoting the development of the circular economic model. In addition to legal documents, the State should soon issue standards, regulations and guidelines related to recycling / reuse. On the other hand, the State needs incentives for businesses to process and consume recycled products...*

*Patrick Chung, CEO, Lee & Man Vietnam*

### 1.3.2. Economic context

The Vietnam plastic and paper industries are both rapidly growing sectors in the Vietnamese economy with annual growth rate of 16-18%. In 2018, the production of the two sectors was 8.3 million tons and 3.7 million tons of (semi and final product). However, both sectors face insufficient materials for production and that requires outreach to the international market. According to preliminary figures, the plastic sector is much more dependent on international resources. Up to 77% of the materials are imported, while that of paper sector is 57%. The production of paper is much more dependent on imported scrap (49% of material demand) than that of plastic sector (7% of material demand). ***The development of the plastic sector will depend largely on availability, quality and prices of imported resin while that of the paper sector will depend on imported scrap.***

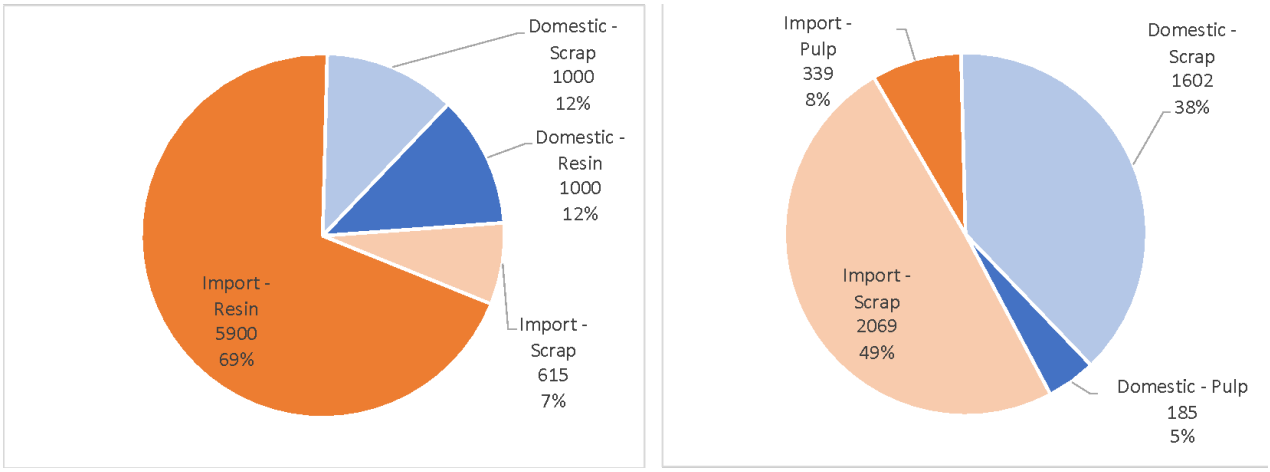



***Figure 3. Material structure of plastic and paper production (thousand tons)***

**Plastic sector**

The plastic industry is growing rapidly in Vietnam. The industry experienced annual growth rate of 16-18% (after telecommunications and textiles). In the 1990s, plastic consumption in Vietnam was only 3.8kg/year/person. However, it has grown 10 times as fast in the subsequent 20 years, reaching reached to 41 kg/year in 2015. According to the Vietnam Plastic Association (VPA) and the Chemical Master Plan, by 2023, the volume of plastic input materials for production is projected at 10 million tons, of which 2.6 million tons (26%) will come from domestic sources and the remaining 7.4 million tons will be imported.

In 2018, Vietnam imported 6.5 million tons of plastic resin and scrap to produce 8.3 million tons of products (See table 8 for more information).9 The material flow in the plastic sector is presented below.

[9] The material flow in the plastic sector showed a gap of around 2.1 million tons (Input-output). While the data is collected from official sources including VPA, MOIT, MONRE and calculated based on maximum possible rate of domestic scrap (700-1000 Ktons), this can only be explained by improper registration and reporting of import and export plastic scraps and recycled resin as well as estimation of recycle scrap ratio within the country of the VPA.

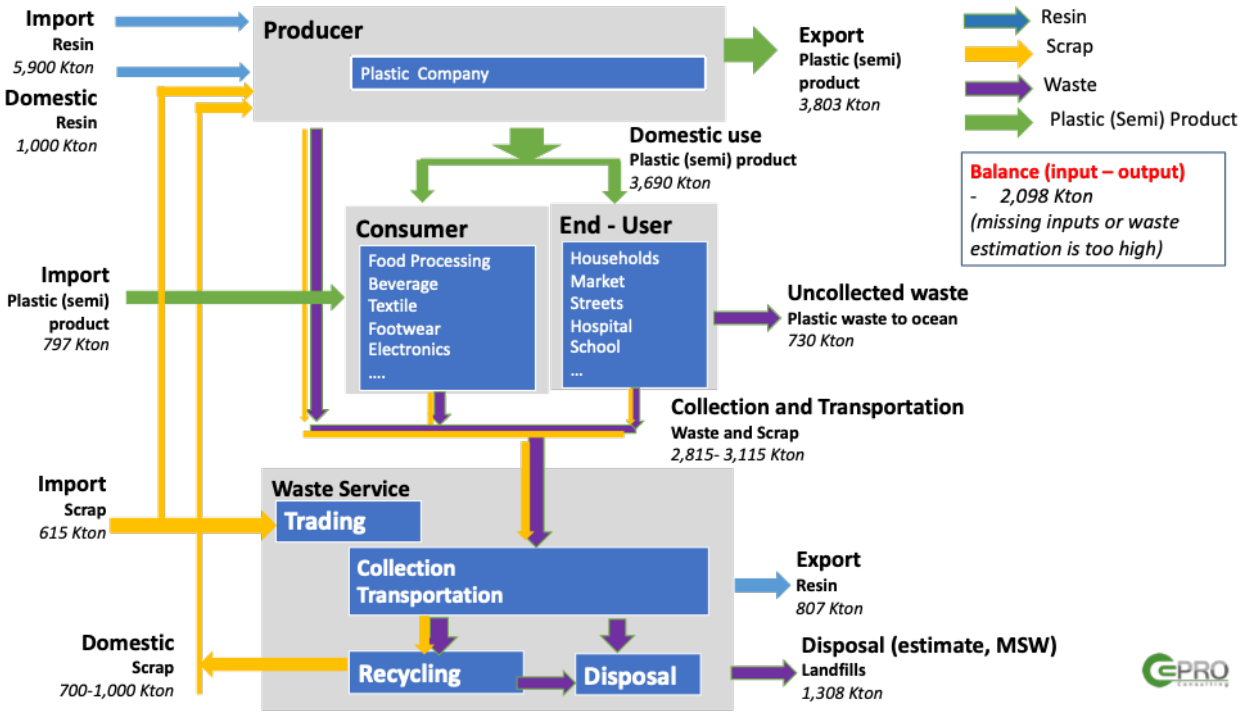



***Figure 4. Material flow in plastic sector***

***Raw material cost for plastic materials depends on the cost of oil***. On average the material cost from import is 1,626 USD/ton, i.e. 9.6% higher than that in the same period of 2017. Vietnam imported resin and plastic by-products from three main markets: China, at 37.6%, Korea, at 24.2%, and Japan at 10.7%.

Since China banned imports of plastic waste, the outreach to the scrap material market seems to be more attractive to Vietnamese companies. In 2018, the Custom of Vietnam stopped 10,000 containers at the border. Two waste service companies, Truong Thinh and Hong Viet, were identified as trying to import 13,000 tons of plastic waste to Vietnam with fake papers. This might explain the data gap in material flows with undiscovered cases. ***The import of plastic scrap plays an insignificant role in the development of the sector, but it creates trouble for management and will not be continued after 2024.***

Under decision 1621/QD-TTg dated 18 September 2013 on the master plan for development of the Vietnam chemical sector to 2020 with orientation to 2030, seven investment projects were listed for providing materials for the plastic sector. In the long run, Vietnam's plastic sector will be ***less independent on imported materials, which aligns*** with the national policy of not importing plastic scrap for production by 2024. In November 2018, Nghi Son oil refinery officially started operation with a design capacity of 370 thousand tons of polypropylene per year, which will meet nearly 50% of domestic demand, and 400 thousand tons of PET plastic pellets, officially put into production and business in Vietnam in September 2018. By 2020,

the domestic supply for plastic materials is expected to l meet 44% of demand, significantly reducing dependence on imported raw materials.
The table below presents the investment plan for plastic materials in Vietnam.

| No | Project | Location | Capacity (1000 ton per year) | Investment (million USD) | Duration |
|---|---|---|---|---|---|
| 1 | Southern Chemical Complex | Vung Tau | 800PE, 450 PP, 400 VMC, 96 EDC, 80.5 Butadiene | 4500 | 2011-2018 |
| 2 | PVC Company | South | 300 | 200 | 2016-2020 |
| 3 | PP Company | North | 300 | 200 | 2016-2020 |
| 4 | PS company | North | 60 | 70 | 2016-2020 |
| 5 | Chemical complex from coal to produce PP, butadiene | North, Central | | | 2021-2025 |
| 6 | PET Company | Central | 300 | | 2021-2025 |
| 7 | PS, ABS Company | | 100PS, 100 ABS | 2021-2025 | |

***Table 1. List of investment projects on plastic materials in Vietnam***

*Source: Decision 1621/QD-TTg*

**Paper Sector**

According to statistics of the General Department of Customs, Vietnam's paper consumption demand increased by 8-10% in 2018, during which the demand for packaging paper increased 15% per year. The paper consumption market for packaging is expected to grow at an average of 9% until 2025. The total export turnover of Vietnam's paper and paper products in the first 10 months of 2017 reached US$602.39 million, an increase of 45.7% over the same period in 2016 (VCCI, 2018). Despite such a high growth rate, the annual import volume is still expected to be 2 million tons. In general, Vietnam is in a trade deficit for paper and paper scraps (total imports are three times larger than exports), because the domestic supply is not enough to meet domestic production demand.

Similar to the plastic sector, the material flow in paper sector in 2018 also showed a ***balance between inputs and outputs of 145,000 tons. This is 4% of input materials, and is acceptable.*** The material flow is presented below

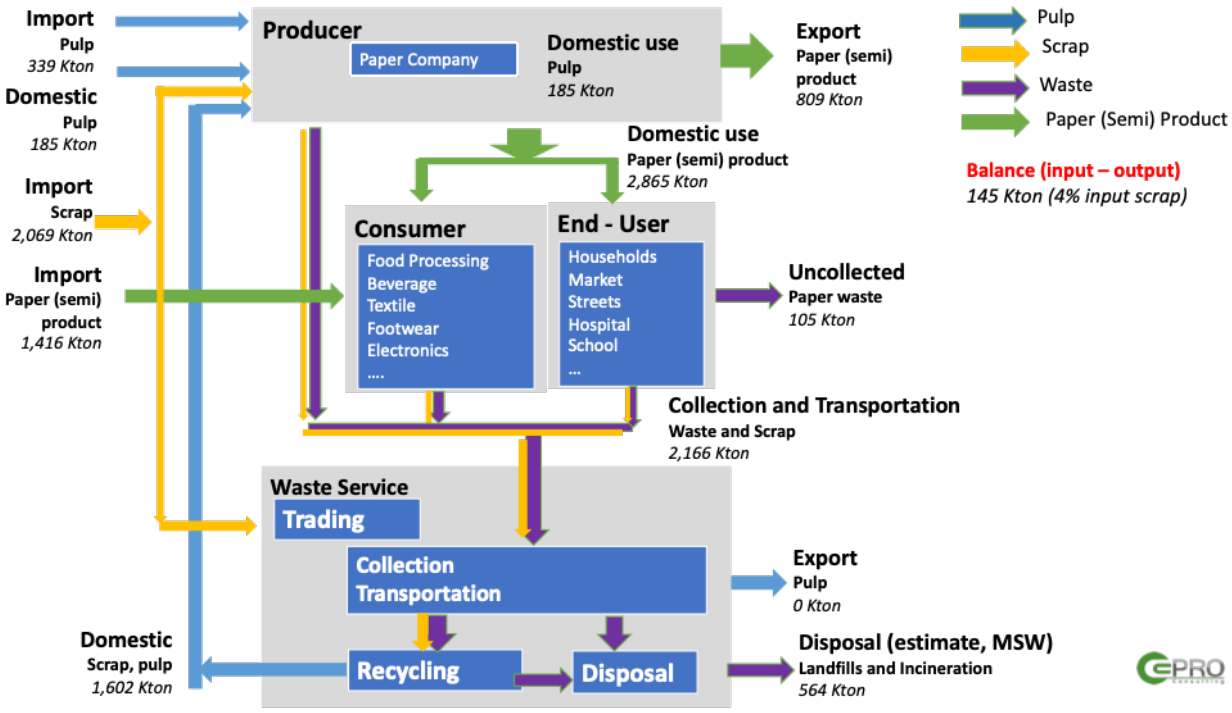



***Figure 5. Material flow in paper sector***

Unlike the plastic sector, where most materials are imported in the form of resin, the paper sector mainly imports paper scrap rather than pulp. Only particular pulp of BCTMP, BSKP and UKP is imported. Annually, the country is exporting an additional 10 million tons of chip wood as raw materials for paper production. The table below presents sector projections by the Vietnamese Pulp and Paper Association (VPPA), in which the volume of scrap being collected and imported increases over the year to meet production demands. However, ***the amount of imported scrap increases from 46% in 2015 to 60% in 2030***.

| Year | 2015 | 2016 | 2017 | 2018 | 2022 | 2026 | 2030 |
|---|---|---|---|---|---|---|---|
| Collection | 965 | 1066 | 1372 | 1602 | 3184 | 5218 | 6420 |
| Import | 810 | 832 | 1356 | 2069 | 5195 | 7827 | 9630 |
| Used in production | 1775 | 1898 | 2728 | 3671 | 8379 | 13045 | 16050 |

***Table 2. Overview of scrap paper collection and utilization (thousand tons)***

As mentioned above, the Circular 41/2018/TT-BCT on the list of scrap categories to be terminated with trading, import and re-export until December 2019 includes all kinds of scrap paper (HS code 4707). It is also under revision not allow to import a sub-category of mixed paper scrap (HS code 4707900) due to not being sorted out at the source for proper checking. This will significantly impact the operation of the sector since the main importers are paper producers.

| Mix paper scrap import by | June-Dec 2017 | Jan-June 2018 |
|---|---|---|
| KRAFT VINA Paper Co., Ltd | 156,878 | 104,295 |
| Lee & Man Vietnam Paper Co., Ltd | 89,475 | 99,402 |
| Chanh Duong Paper Mill Co., Ltd | 57,991 | 31,235 |
| Dong Hai Ben Tre Joint Stock Company | 26,837 | 32,882 |
| Dong Tien Binh Duong Paper Co., Ltd | 27,881 | 19,210 |
| JP Corelex (Vietnam) Co., Ltd | 15,449 | 10,251 |
| Saigon Paper Joint Stock Company | 6,229 | 8,644 |
| Muc Son Paper Joint Stock Company | 3,926 | 12,585 |
| Dong A Bac Ninh Company Limited | 1,771 | 23,853 |
| A.F.C Paper Co., Ltd | 5,925 | 20,438 |
| Lam Son Thanh Hoa Paper Joint Stock Company | 15,810 | 3,517 |
| Go Sao Industry and Trade Co., Ltd | 1,915 | 2,641 |
| An Binh Paper Joint Stock Company | 748 | 553 |
| Total | 410,835 | 369,506 |

***Table 3. List of mix paper scrap importers and import volume (ton)***

*Source: VPPA, 2018*

In general, the import of scrap for production has not been performed as regulated. According to the Custom of Vietnam, within the first six months of 2018, Vietnam imported 4,027 million tons of scrap with value of 1,232 billion USD, about the same values of 2016 (4,783 million tons, 1,041 billion USD). Among this imported scrap, 1,062 million tons is paper scrap and 0,278 million tons is plastic scrap. Also, in the first six months of 2018, Vietnam had 240 importers, which included 90 for plastic and 78 for paper scraps. Many imported containers either had not been inspected or did not meet environmental requirements and were detained at ports. The number of importers has been reduced to 86 and is being published by Custom of Vietnam, where the slow process will cost the importer 40-50 USD per day per container.

### 1.3.3. Environmental Context

High economic growth has come at a cost. The rapid growth of the paper and plastic industry in Vietnam has resulted in considerable pollution, which poses increased risks to the environment and human health. The paper and plastic recycling industry involves a multi-step process in which scraps are converted into products or resins, producing significant amounts of waste pollutants.

Recently, however, the fast growth of the industry and growing public awareness of the risk of pollution to human health and the environment have attracted increased

attention from communities, local authorities, and environmental scientists. Recycling waste, using imported scrap to make material for production (including plastic and paper scrap) are classified industrial production types with high risk of environmental pollution (Decree 40/ND-CP).

Vietnam became one of the alternative waste dumping sites when China stopped importing waste starting 1 January 2018. MONRE (environmental protection), MOIT (import-export) and Custom of Vietnam faced a difficult task in identifying and certifying the import of scrap for production only. Thousands of scrap containers have been blocked at ports due to not meeting quality standard for import or not being imported with proper documents. Sampling and checking procedures are challenging when mixed categories of scraps are imported. Due to environmental concerns and limited resources, ***the government is working on simplifying the checking procedure. At the same time, it is shortening the list of eligible scrap items to import*** to ensure compliance on environmental protection.

Waste recycling within production and maximum recycling of hazardous waste (contaminated plastic and paper) before treatment are common practices to reduce production costs. Outdoor waste recycling is conducted by waste treatment companies, industrial production companies of paper and craft villages. While paper scraps are processed by both waste treatment facilities and paper producers, plastic producers do not purchase scrap as raw material, but do purchase resin and recycled resin. The recycling industry, especially in paper and plastic, was traditionally regarded in Vietnam as a low-tech industry characterized by small paper and plastic craft villages scattered around the country. From the beginning, the operational scale of the village has been small and mainly family-based, thus it was not seen as an industry that should be seriously considered from both social and environmental points of view. Today, however, some large paper companies including FDI have been set up, driven by the dramatic increase in the demand for paper products. ***There is a strong link between waste service providers and producers in the paper sector while less is known regarding the plastic sector.***

For plastic and paper waste that is unrecyclable, landfill or burining is the only option. There is no treatment plant for plastic incineration nor RDF so far. Currently Vietnam has one pilot initiative from Dow Chemical to utilize four tons of plastic waste for road making 1km in Hai Phong city. Vietnam is discharging an estimated 0.28 – 0.73 million tons of plastic waste into oceans annually. According to MONRE, there are 12.36% of plastic waste and 5.05% of paper waste in landfill.

In Vietnam, there is no central data bank on volume and composition of solid waste. While the data on total volume of domestic waste in urban area is available over the years and maintained by Ministry of Construction, data on other categories of non-

hazardous waste as domestic waste from rural area, industrial waste, medical waste, construction waste and hazardous waste are not publicly available in total, but only with ad-hoc values. According to data collection system of Ministry of Construction, the domestic MSW has increased by 11.7% per year since 2005. In 2018, the volume of domestic municipal collected was 40,460 tons per day, in which 24.4% of collected waste is either handled by waste recycling units, being composted or incinerated, the remaining waste is sent to landfill. This leads to estimation of at least 1.38 million tons of plastic waste and 564 tons paper waste remains in landfills. ***The unavailable data on waste generation at national scale may lead to mis-calculation of waste volume to be treated and disposed***.

Insofar as the Vietnam government continues to emphasize the role of industrialization to boost economic growth, exports and increase the competitiveness of its paper and plastic products, so has its need to protect the environment also increased. Vietnam can nevertheless benefit from meeting environmental standards as its competitiveness will be strengthened and its natural resources will be used sustainably. In other words, environmental requirements pose both challenges and opportunities for the country.

### 1.3.4. Summary: Obstacles and Opportunities

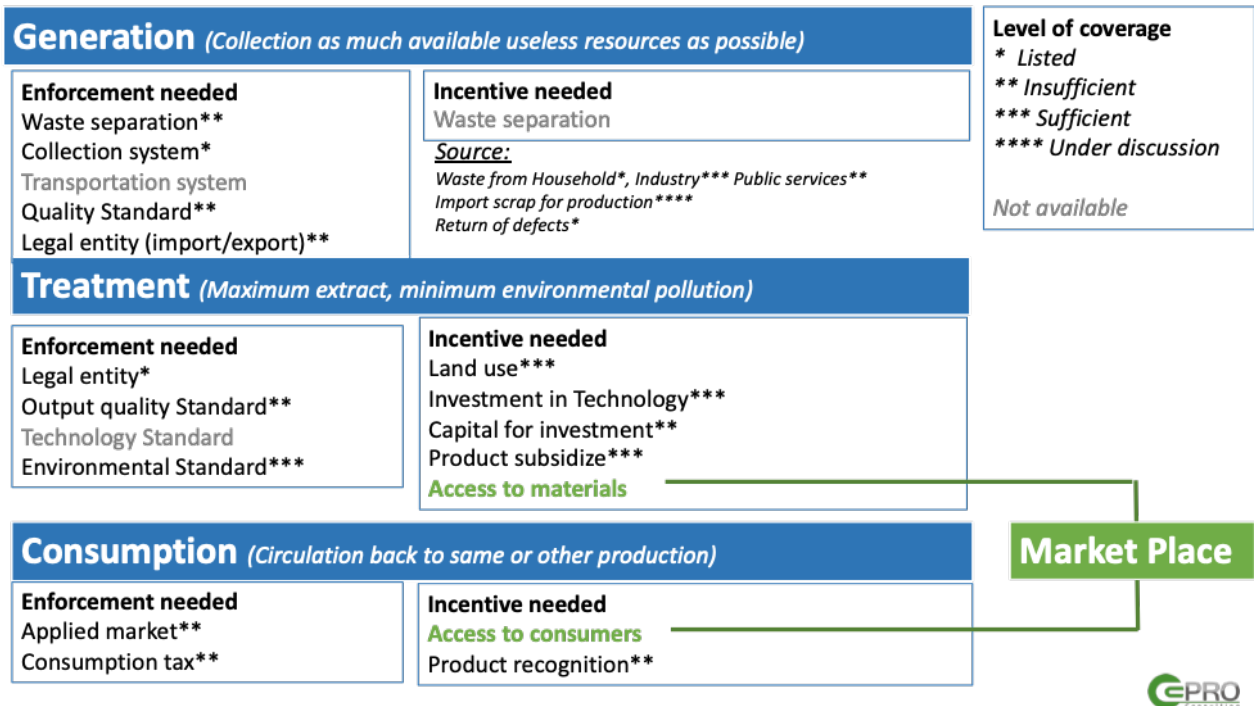



***Figure 6. Vietnam National Context for waste circulation***

# Study activities and results

This study was conducted in two phases with the following activities:

- Desk study: Review legal framework, assess the role of the authorities and recommend on the deployment of a circular economy model in the plastic and paper industries. During this activity, the material flow, related contents under circular economy model was identified to prepare interview and survey plan.
- Interview and questionnaire survey: Assess the willingness to participate in a circular economy model of stakeholders, including buyers, sellers of recycled plastic and paper materials, and supporting service providers and establish an initial database of buyers, sellers and supporting service providers for further development on a secondary materials market of the two industrial sectors.

## 2.1. Desk Study – results

### 2.1.1. Scope

This study is conducted to develop material market for plastic and paper sector. Within this scope, circular model focuses on analysis of scrap and waste flow rather than its volumes. The analysis will focus on the involvement of stakeholders from waste generation, transportation, treatment, disposal and circulation back to production.

The study on other aspects of circular economy as prolong product lifetime or reduce demand, avoidance of usag is not covered under this study.

### 2.1.2. Legal framework

Vietnam has developed a comprehensive legal framework for waste recycling, including legislation for enforcement and incentives. The overview of this framework is presented below

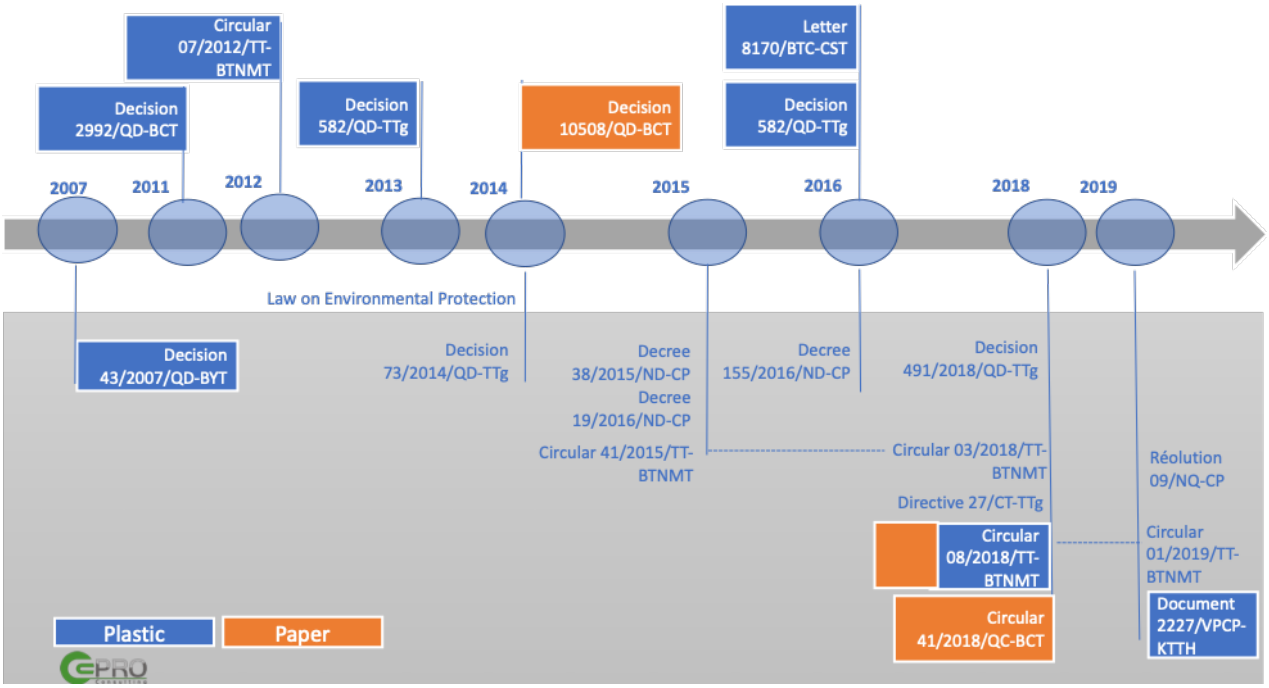



***Figure 7. Overview of main incentives and enforcement framework***

| | |
|---|---|
| **Plastic and paper waste management** | |
| Law on Environmental Protection 2014<br>(Term 3 of Article 6) | Advices to control, collect, reuse and recycle wastes |
| Decree No. 38/2015/ND-CP on management of waste and scraps issued on April 24, 2015 | Requested to classify, manage waste from generation, collection, transportation and treatment; the Decree also regulates that:<br>● Some other articles set requirements on importing plastic scraps for recycling as raw materials for some domestic production and regulations on management of wastes.<br>● Waste owner shall be responsible for recycling, pre-processing, recovering, co-treatment, heat recovery or contract with a service provider for waste and waste material management" (article 30).<br>● Infectious waste after disinfection shall be treated like ordinary waste by suitable methods (point b, Term 5, Article 49).<br>● Waste materials are imported for production will be stored in covered place with fire and dust prevention measures in place. The importers shall have facilities for recycle, recovery and impurities treatment per requirement and must deposit to ensure the import materials is stored properly (article 56).<br>● Waste importer is required to obtain license on environmental protection and the list is published by MONRE (https://dvctt.monre.gov.vn) |
| Decision 491/QD-TTg on May 07, 2018, on adjustments to National Strategy for general management of solid waste to 2025 with vision towards 2050 | ● Identified the specific requirement for domestic waste at urban area is to 100% environmental friendly plastic bags in shopping centers, supermarket instead of normal plastic bags and 90% of domestic waste in urban area is collected and treated properly, in which direct landfill is expected to be lower than 30% of amount of waste collected |
| Decision 582/QD-TTg dated April 11, 2013 of the Prime Minister approving the project on improving the environmental pollution control for the use of non-biodegradable plastic bags by 2020 | ● The target of the Decision is to reduce 65% of plastic bags in 2020 (in comparison with 2010) |
| Decision No. 43/2007/QĐ-BYT on the management of medical wastes | ● Regulates the list of medical wastes, which are allowed for collection for recycling. According to this, waste plastic bottles containing nonhazardous chemicals and other plastic containers not containing hazardous substances are considered recyclable plastic wastes to be collected |
| Circular No. 07/2012/TT-BTNMT | ● Providing the criteria, order of and procedures for recognition of environment friendly plastic bags, in which exemption of environmental protection fee is applied for environment friendly plastic bags |
| Letter No 19/VBHN-BCT on detailing Law on Trading, services to be banned, limited and with conditions | ● Domestic waste and recycle paper and plastics is not listed as good with limited trading or trading with conditions |
| **Import and export plastic and paper scrap** | |
| Directive No. 27/CT-TTg on some urgent measures to strengthen the management of import and use of imported scrap as raw materials for production | ● The recent ban on importing waste plastic of China brings special interest of Vietnam producers, importers and its associations in participating in the plastic recycled industry as most of them are from private sector with high business flexibility and sense. The quantity of imported recycled plastics, including waste plastic in first nine months of 2018 was 175,000 tons, nearly double of that in whole 2017. In response to this issue, the Prime Minister has issued the Directive No. 27/CT-TTg on some urgent measures to strengthen the management of import and use of imported scrap as raw materials for production. According to this regulation, there is no permission for the import of scraps only for preliminary processing |
| Circular No. 41/2015/TT-BTNMT dated September 9, 2015 issued by Ministry of Natural Resources and Environment on environmental protection in importing scraps for use as raw materials | ● Procedure and types of imported scrap. It includes requirements on checking, custom approval with papers, certificates on environmental protection that prolong the storage time at custom. The recent promulgation of Circular 03/2018/TT-BTNMT revising some item in Circular 41/2015/TT-BTNMT simplifies list of goods and checking procedures |

| | |
|---|---|
| Circular 08/2018/TT-BTNMT | National Technical Regulations on Environment for imported plastic scraps QCVN 32:2018 was issued by the Ministry of Natural Resources and Environment (improved from the National Technical Regulation on Environment to import waste plastic for production QCVN 32:2010/BTNMT)<br>This sets the requirements on detailed contents of the contract on importing plastic scraps and compulsory commitments; types, pre-cleaning, classification and labeling of plastic scraps legitimate for being imported.<br>According to this regulation, plastic scraps are legally imported including:<br>● Plastic discards from production process, which are unused;<br>● Plastic packaging (PET) containing drinking water;<br>● Uses plastics appear in forms of blocks, lumps, bars, strips;<br>● Other plastics which are cut into small pieces and cleaned;<br>Plastic scraps are not allowed to be imported including:<br>● Used plastics which are not satisfied applied regulations;<br>● Plastic covers of used equipment, electric equipment such as television, computer, office appliances containing flammable resistant;<br>● Unfinished combustion plastic |
| | National Technical Regulations on Environment for imported paper scraps as production materials (QCVN 33:2018/BTNMT) mentioned that:<br>Impurities that are not mixed in imported paper scraps include:<br>● Chemicals, inflammables, explosive substances, and hazardous medical wastes.<br>● Materials containing or contaminated with radioactive substances exceed the exemption level prescribed in QCVN 05: 2010/BKHCN - National technical regulation on radiation safety - exemption from declaration and licensing issued together with Circular No. 15/2010 / TT- BKHCN dated September 14, 2010 of the Minister of Science and Technology.<br>● Hazardous impurities (According to the Environmental Protection Law 2014, hazardous impurities are wastes containing toxic, radioactive, infectious, flammable, explosive, corrosive, poisonous or hazardous properties other harm).<br>Unwanted impurities are allowed to be mixed in imported paper scrap (no more than 2% of the shipment volume):<br>● Adhesives such as dust, soil, sand; lanyards and materials used to package imported paper scraps.<br>● Residues of chemicals against fungi, mold, and insects used to preserve paper scraps before shipping.<br>● Other impurities that are commonly used with paper such as pins, plastic, adhesives and other materials that stick or leave from imported paper waste: The total amount of these impurities does not exceed more than 2% of the volume of the shipment.<br>● Humidity: not exceeding 20% |
| Decree 187/2013/ND-CP detailing Law on Trading, international trading, buying, selling, processing and storing abroad) | Waste plastics, paper, recycled resins, pulp can be exported as normal goods. Concerning about the environmental pollution issues from pulping waste paper, the Vietnam Paper Association recently proposed to the Ministry of Industry and Trade to increase control measures on importing and exporting recycled pulp. |
| Decision No 73/2014/QD-TTg on list of waste materials to be imported | Waste and waste materials cannot be imported for trading, but production. The waste and waste materials can only be imported with Ministerial level permission (Article 5 of Decree 187/2013/ND-CP). MONRE is providing the permission to the entity that directly use (or with authority of producer) for production (Decree 38/2015/ND-CP on waste and waste material management). The permission is provided case by case with reference to the Decision No 73/2014/QD-TTg on list of waste materials to be imported as production materials including 36 types, of which the main groups are plastic, glass, paper, and metal. Imported paper scrap groups include the following types of scrap:<br>● Recovered paper (waste and scrap) or paperboard: Kraft paper or kraft paperboard or corrugated or unbleached paper or paperboard.<br>● Waste paper or waste paperboard: Other paper or paperboard made mainly of pulp obtained from bleached, untreated chemical processes. |

| | |
|---|---|
| | ● Waste paper or waste paperboard: Paper or paperboard made mainly of pulp obtained from mechanical processes (for example, newsprint, magazines and similar publications).<br>● Waste paper or waste paperboard: Other, including waste and scrap that not classified (HS 4707.90.00 codes). For paper enterprises, this kind of waste paper, particularly is a group of mixed waste paper, which plays a very important role because it is the main input of raw materials for domestic production.<br>Currently the Government slowed down process to grant licenses for importing waste materials while some companies already made investment on waste plastic and paper recycling. The situation is reported to MONRE by plastic association, but not paper one. |
| Official Letter No. 3738/TCHQ-GSQL dated 26/06/2018 of the General Department of Finance and the Ministry of Finance on the management of imported scrap. | On June 26, 2018, the General Department of Customs sent an official dispatch to the Customs Departments of the provinces and cities across the country requesting the sending of imported scrap samples to the Customs Inspection Department for analysis and assessment of suitability and environmental technical regulations before customs clearance. This inspection process applies to all imported scrap shipments. Dispatch takes effect immediately from the date of issuance. |
| Others | A series of Free Trade Agreement of Vietnam such as Vietnam-Eurasian Economic Union FTA, ASEAN Trade in Goods Agreement (ATIGA), ASEAN - China FTA, ASEAN - South Korea FTA, Vietnam - Japan FTA, ASEAN-New Zealand FTA, ASEAN-India FTA, Vietnam – Chile FTA, Regional Comprehensive Economic Partnership (RECP) and Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) is positive factors support for plastic products of Vietnam to increase their export competitiveness to other countries, as well as to expand the suppliers of input materials |
| **Environmental protection tax and punishment:** | |
| | Laws on Environmental Protection Tax since 2012 regulated the non-environmental friendly plastic bags (Polyethylene) are subjected to charge environmental protection fee |
| The Decree 155/2016/ND-CP on November 18, 2016 on punishment in environmental protection | |
| Decree No. 19/2015/NĐ-CP | Regulates that the Ministry of Finance set regulations on exemption and reduction of exported products, which are mentioned in Term 12, Annex III of the Decree |
| Document No. 8170/BTC – CST issued on Jun 15, 2016 by the Ministry of Finance | Regulates on the import and export tax exemption for recycled plastics from hazardous wastes |
| **Development strategy of plastic industry as well as recycling activities** | |
| Decision No 2992/QD-BCT on master plan for plastic sector to 2020 with vision to 2025 | There is a plan for increasing usage of waste material ratio in sectoral master plans: The plastic sector aims to treat plastic waste to materials in order to increase the ratio of domestic materials |
| Strategy on Cleaner Production in Industry toward 2020 (issued by the Prime Minister's Decision No. 1419/QD-TTg on 07/9/2009) | |
| National Strategy on Green Growth (issued by the Prime Minister's Decision No. 1393/QD-TTg on 25/9/2012) | |
| National Action Plan for implementing the Agenda 2030 for Sustainable Development (issued by the Prime Minister's Decision No. 622/QD-TTg on 10/5/2017) | |
| National Action Plan on Sustainable Consumption and Production by 2020 with the vision towards 2030 (issued | |

| | |
|---|---|
| by the Prime Minister's Decision No. 76/QD-TTg on 11/01/2016); | |
| Decision No. 10508 / QD-BCT approving the Planning on development of Vietnam's paper industry by 2020, with a vision to 2025 | Setting the target to 2025 to achieve the domestic recovery rate of 65%. By 2025, there is no license and gradually eliminating outdated paper and pulp factories with a scale of less than 10,000 tons/year |
| Circular No. 12/2015/TT-BTNMT issuing national technical standards on environment, including QCVN 12-MT:2015/BTNMT on pulp and wastewater that revised based on QCVN 12:2008/BTNMT | The Circular specifies the maximum allowable values of pollution parameters in pulp and wastewater of paper industry when discharging into the receiving sources. Specifically, technical regulations on the maximum allowable value of pollution parameters in pulp and waste water of paper industry when discharged into receiving sources; coefficient of receiving source Kq, coefficient of waste discharge Kf |
| Decision No. 3892/QD-BCT is issued on September 28, 2016 by Minister of Industry and Trade approving of master plan for industrial development in the Red River Delta by 2025 with the vision toward 2030 | Detailed objectives are set for the plastic production (pipes, packages and other products) in Hai Phong, Hanoi, Hung Yen, Bac Ninh and Hai Duong and biodegradable and recyclable plastic container production is encouraged |
| Decree No. 68/2017/NĐ-CP issued on May 25, 2017 on management and development of industrial clusters | Provides the regulations on fields, sectors, production and business units, which are encouraged for moving into industrial clusters at Article 3. Those include production and business units polluting or having highly-polluted potentials, which locate in craft villages, residential areas, cities should move into industrial clusters. There is policy of preferences and supports on investment provided to craft village clusters |
| National Plan for implementing Stockholm Convention on persistent organic pollutants (issued by the Prime Minister's Decision No. 1598/QD-TTg on 17/10/2017) | |
| Vietnam's Sustainable Development Strategy for the period of 2011-2020 (issued by the Prime Minister's Decision No. 432/QD-TTg on 12/4/2012) | |
| Circular No. 31/2016/TT-BTNMT on environmental protection of industrial clusters, concentrate businesses, service providers, craft villages, production, commercial and service establishments. | |
| Resolution No.09/2019/NQ-CP from February 3, 2019 of the Prime Minister from the Government meeting No.1, chapter on management of import and use of imported scrap as production materials. | This assigned MONRE to be in charge of state management of solid waste and requested MONRE to review, complete, supplement, and develop legal documents on environmental protection in importing scrap for production purposes. Particularly for plastic scrap, it is allowed to import as raw materials for the production of plastic sticks only by December 31, 2024 |

***Table 4. Summarized the relevant contents of legal context***

### *2.1.2.1. Observation*

The issuance of the QCVN 32:2018 and QCVN 33:2018 on quality requirements for importing plastic scrap and paper scrap generated heated discussion about importing regulation. Current legislation also states that imported waste materials must not contain impurities greater than 2%, and moisture less than 20% (Circular 08/2018/TT-BTNMT). However, it is difficult for the customer to validate this value

with mix materials. China banned a number of waste materials to be imported, thus they came to Vietnam and were stopped by customs. In September 2018, the government promulgated Directive Number 27/CT-TTg on urgent measures to strengthen the management of importing waste materials for production. The directive requires MONRE to review and shortlist the waste materials categories to be imported in the 4th quarter of 2018. MONRE is considering a revision of Decision 73/2014/QD-TTg, in which the category for mix waste paper, coded HS 47079000 and the entrusted entity for importing waste materials are no longer valid. Both the Vietnam Paper and Plastic Associations recommended that the Vietnam Government view the availability of waste materials to be imported as an opportunity rather than risk without compromise to the environment. The following reactions of stakeholders were observed:

- Firstly, the limitation of scrap importers may cause challenges for domestic trade (Decree 38/2015/ND-CP dated April 24, 2015). According to the Decree, subjects allowed to import scraps include individuals or organizations directly using imported scrap as production materials; and individuals or organizations that receive import consignment for organizations and individuals using imported scraps as raw materials for production. However, the Prime Minister's Directive No.27/CT-TTg requested limiting the importers and only individuals or organizations that directly use imported scrap as raw materials. Since the industry structure in Vietnam is small and medium enterprises, ***not all enterprises have the capacity to import scraps by themselves***. It is very important to create conditions for individual organizations to import in the form of a mandate to supply individuals and organizations. The policy should be expanded to facilitate domestic trade as well as to support small and medium-sized enterprises in production.
- Secondly, prohibiting the import of some types of scrap, especially mixed paper scrap, will considerably affect the operation of the paper industry (Decision 73/2014/QD-TTg dated December 19, 2014 of Prime Minister). The suspension or ban of imports will force businesses to seek other sources of raw materials, leading to an ***increase in input costs***. Besides, the suspension of import or import of mixed paper scraps will lead to interruption in production and business. In addition, the import of mixed paper scraps is necessary to ensure the quality of paper packaging in domestic production. Furthermore, if imports of mixed paper scrap are banned, the structure of the industry will likely shift in the direction of increasing import; export may decline because enterprises cannot maintain production and business activities to serve export and domestic demand, as well as compete with other countries in the world.

- Regulation on ***proportion of impurities is too tight***, making it difficult for waste materials from abroad to meet import standards (Circular 08/2018/TT-BTNMT of Ministry of Natural Resources and Environment).

#### *2.1.2.2. Plastic sector:*

The review found that there are quite a number of regulations ruling the production process of plastic recycling. However, the technical requirement for collection and transportation of plastic waste is not yet available. Moreover, in order to promote the public usage of recycled plastic products as well as to commercialize those products, technical regulations in term of chemical, physical, durable properties should be developed.

The source of domestic plastic scraps collected does not meet the demand, meanwhile, imported plastic scraps are classified with good quality, large quantity, ensure high capacity production. Facing this situation, the VPA has proposed to amend some contents of the plastic scrap import list in Decision 73/2014/QD-TTg and QCVN 32:2010 and to set up the "***Recycling Environment Fund***" by contributions of enterprises involved in scrap recycling activities. Charges are from VND 50,000 to VND 100,000 per ton of raw material calculated on the basis of the import volume. The fund is expected to process from VND 500 to 1000 billion per year. This fund will be used for the construction of wastewater treatment plants for plastic recycling craft villages. This will support waste sorting at the source, management of unqualified imported scrap lots, and inspection for compliance with environmental legislation in recycling plants. This action also showed that it is necessary to have a platform for enterprises involved in the value chain of the plastic industry.

In summary, in order to address the sustainable development strategy of the plastics industry, the policy framework should focus on ***encouraging domestic production of raw materials***, minimizing dependence on imported raw materials while the cost of plastic raw materials represents more than 70% of total production cost. If the source of recycled plastic is utilized properly to become a new life cycle of a product, its price will be lower than those produced from primary plastic. In addition, enterprises should pay attention to technology innovation to improve product quality. However, plastic machinery is mostly imported requiring high investments. Therefore, it is necessary to develop additional supporting industries in the country in order to support the development of domestic plastic recycling technology.

#### *2.1.2.3. Paper sector*

The paper industry plays an important in the development of Vietnam's economy. In particular, recycled materials are the key to the development of the paper industry towards sustainability and environmental protection. Since the recent changes in the recycling market context, Vietnam is facing a great opportunity to gain access to abundant sources of recycled materials and affordable prices. If the opportunity is grasped, the competitiveness of Vietnamese paper products will increase markedly. The policies of the paper industry ***need to be improved in the direction of output control (emission standards, waste water, and solid waste) of manufacturing enterprises, instead of the current system of controlling portfolios***, inputs and checks at ports.

According to VPPA, recycled paper imported from many markets all around the world, like the US and Europe has the length and toughness, the tensile strength of paper always more qualified than domestic paper waste. In fact, in developed countries, paper waste has long been considered as an important input for the paper manufacturing industry and a key export item, which contributes significantly to the GDP value. Therefore, the quality of these paper waste sources is very stable, fully meeting the standards for manufacturing recycled paper.

### 2.1.3. Role of authorities

Waste and Scrap management responsibilities at the central level belong mainly to the Ministry of Natural Resources and Environment, Ministry of Construction and Ministry of Industry and Trade.

MONRE is the environmental management agency responsible for implementing the Law on Environmental Protection. MONRE regulates the quality requirements for importing scraps according to international commitment and Vietnam Law. MONRE provides certificates for scrap importers, provides guidance and inspection on environmental performance of all participating stakeholders. The Ministry of Construction (MOC) is responsible for municipal waste management and waste treatment and disposal facility (urban infrastructure management). Under Resolution 09/NQ-CP dated 3 February, the overall responsibility for waste management (urban solid waste, medical waste, rural waste, industrial waste) will be MONRE.

MOIT is responsible for development of industry, domestic trading and import-export performance according to regulation, providing guidance and supervision on sustainable industrial development, including environmental performance. MOIT is establishing environmental industry toward waste management.

Besides MONRE and MOIT, depending on the investment stage, other relevant stakeholders may be MPI (planning and investment), MOST (science and technology), MOF (finance).

Each line Ministry has its line Department at the provincial level. The People Committee, differing slightly from province to province, will decide the authorities of local department.

### 2.1.4. Observation

The authorities between MONRE and MOIT are clear, but overlap in two main areas of import-export scrap and waste recycling service. Under the scope of import-export, both Ministries are responsible for scraps entering Vietnam. While MONRE needs to make sure scrap is not waste by its checking procedure, MOIT needs to make sure that scrap follows custom procedure. This double responsibility causes much time and cost to importers and producers. This was simplified by Circular 01/2009/TT-BTNMT and Resolution 09/ND-CP. However, the question of double responsibility of handling domestic scrap as waste or materials remains.

### 2.1.5. Stakeholder mapping

Material Marketplace involves buyer (scrap treatment as waste service producer, manufacturer), seller (scrap generators as manufacturers, consumers, end-users), intermediates (as importers) and supporters (as policy makers, policy execution, research institute, associations….). Under material flow, a manufacturer can be both buyer and seller of scrap.

Three groups of stakeholders are:

- Group 1. Consumer and Users: stakeholders in this group buy (semi) product from producers for further production or own usage and sell post-use product. Buying: They can set customer requirements on purchasing products with recycling material for order.
- Group 2. Producers: Stakeholders in this group provides (semi) plastic and paper products under order of Group 1and can set the customer requirement to waste service provider on quality of recycling products. The requirement is set and check in every transaction to ensure smooth production with existing technology and orders. When purchase recycled scrap for production, decision depends on quality of scrap.
- Group 3. Waste service providers. Business of stakeholders in this group depends on ***availability*** of scraps. Quality of scraps can be solved by technology. Participation of stakeholder in this group is driven by economic incentives.
- Group 4. Other stakeholder: Stakeholders in this group will develop policy and incentives for connecting three groups through their needs. This will not be only policy development, but also assurance of awareness, quality and availability of scrap, so that material flow and transaction will happen and increase.

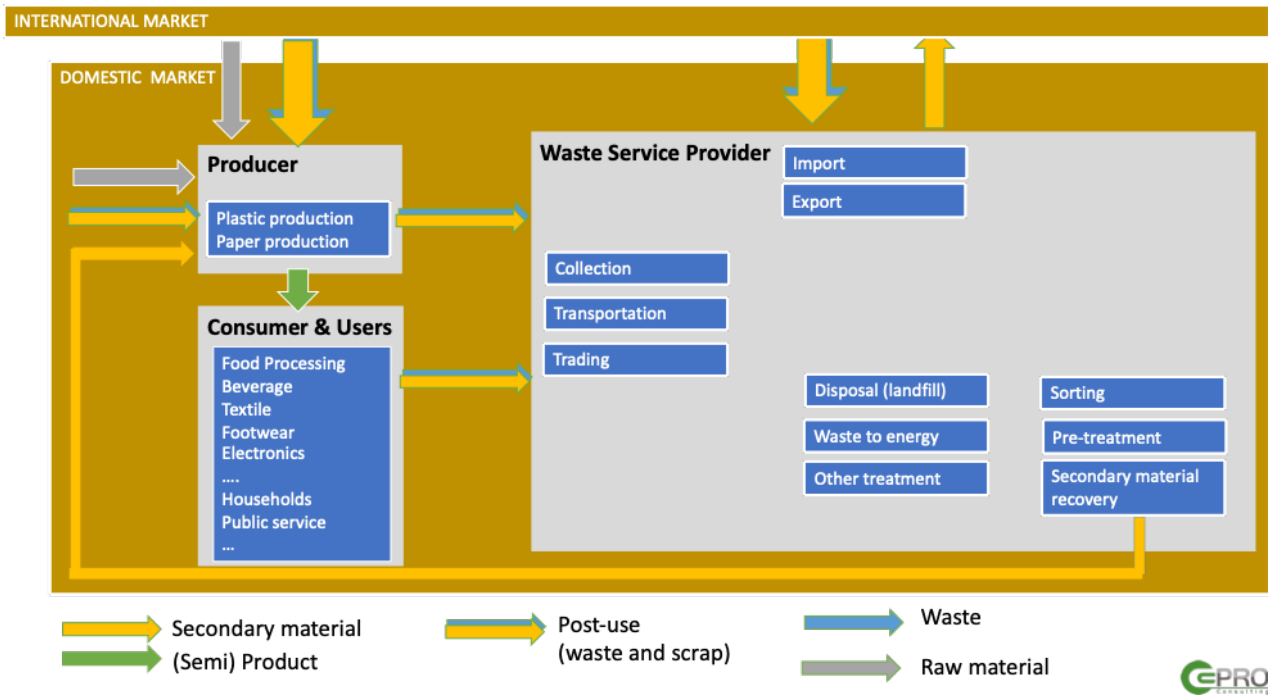



***Figure 8. Stakeholders in material market for paper and plastic sector***

| No. | Name of company | Province | Region | | | Dealing with | Role in value chain | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | North | Central | South | | Producer (ton/year) | Waste service (ton/year) | Original materials (ton/year) |
| 1 | Tien Phong Plastic | Hai Phong | x | | | Construction plastics | 120,000 | | |
| 2 | Binh Minh Plastic | Hochiminh | | | x | Construction plastics | 150,000 | | |
| 3 | Dong Nai Plastic JSC | Dong Nai | | | x | Construction plastics, industrial plastic and packaging | 99,600 | | |
| 4 | A Dong ADG JSC | Hochiminh | | | x | Import and trading primary plastic | 96,000 | | |
| 5 | An Phat Plastic and Green Environment JSC. | Hai Duong | x | | | Packaging plastic, Recycle | 80,000 | N/A | |
| 7 | Dong A Group | Hanoi | x | | | Construction plastic | 51,000 | | |
| 8 | Tan Dai Hung Plastic JSC | Hochiminh | | | x | Packaging plastics | 36,480 | | |
| 9 | Vinh Plastic & Bags JSC | Nghe An | | x | | Packaging plastics | 34,800 | | |
| 10 | Tan Phu Plastic | Hochiminh | | | x | Packaging plastics | 30,000 | | |
| 11 | Hoa Sen Binh Dinh plastic | Binh Dinh | | x | | Construction plastics | 24,000 | | |
| 12 | Rang Dong Plastic JSC | Long An | | | x | Packaging plastic, recycle | 21,400 | N/A | |
| 13 | Ngoc Nghia Plastic | Hochiminh | | | x | Packaging plastics | 20,000 | | |
| 14 | Stroman Hung Yen plastic factory | Hung Yen | x | | | Construction plastics | 20,000 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | Da Nang Plastic Joint Stock Company | Da Nang | | x | | Construction plastic and Packaging | 7,000 | | |
| 16 | Hai Phong Cement Packing JSC | Hai Phong | x | | | Packaging plastics | 5,000 | | |
| 17 | Saigon Plastic Packaging JSC | Hochiminh | | | x | Packaging plastics | 4,000 | | |
| 18 | DO THANH TECHNOLOGY JSC | Hochiminh | | | x | Packaging (bottle, lid, billet) | 3,300 | | |
| 19 | Tin Thanh Packaging JSC | Long An | | | x | Packaging plastic, recycle | 1,920 | N/A | |
| 20 | Tan Tien Plastic Packaging | Hochiminh | | | x | Packaging plastics | N/A | | |
| 21 | VIETNAM PLASTIC CORPORATION | Hochiminh | | | x | Packaging, household plastics, construction plastic and technical plastic | N/A | | |
| 22 | Sadico Can Tho | Can Tho | | | x | Cement packaging | 15,600 | | |
| 23 | MEDIPLAST JSC | Hanoi | x | | | Technical (Single-use syringe) | 200 mil Pieces | | |
| 24 | Liksin Corporation | Hochiminh | | | x | Packaging (box, label) | 250 mil m2 | | |
| | Hung Nghiep Formosa Co., Ltd. | Dong Nai | | | x | PET: 145,000 | | | 205,000 |
| 25 | | | | | | BOPP: 60,000 | | | |
| 26 | Phu My Plastic and Chemical Co., Ltd. | Ba Ria Vung Tau | | | x | PVC | | | 200,000 |
| 27 | TPC Plastic and Chemical Co., Ltd. | Dong Nai | | | x | PVC | | | 190,000 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 28 | Binh Son Refinery Co., Ltd. | Quang Ngai | | x | | PP | | | 150,000 |
| 29 | Vietnam Polystyrene Co., Ltd. | Ba Ria Vung Tau | | | x | PS &EPS | | | 86,000 |
| 30 | LG Vina Chemical Co., Ltd. | Dong Nai | | | x | DOP | | | 40,000 |
| 31 | Euro Film Corporation | Long An | | | x | BOPP | | | 30,000 |
| 32 | Youl Chon Vina Plastic JSC | Binh Duong | | | x | BOPP | | | 12,000 |
| 33 | Branch of Lien Minh Import, Export Trading Service Co., Ltd in Bac Giang | Bac Giang | x | | | PE, PS, PVC | | 104,127 | |
| 34 | Dong A Plastic Co., Ltd | Ha Nam | x | | | PE, PS, PVC | | 96,000 | |
| 35 | A Dong ADG JSC | Hochiminh | | | x | Import and trading primary plastic | | 96,000 | |
| 36 | Branch of Lien Minh Import, Export Trading Service Co., Ltd in Binh Duong | Binh Duong | | | x | PE, PS, PVC | | 90,000 | |
| 37 | Xuan Hoa Transport and Mining JSC | Thanh Hoa | x | | | PE, PS, PVC | | 72,280 | |
| 38 | Viet Nhat Plastic Production, Import, Export Trading Service Co., Ltd | Long An | | | x | PE, PS, PVC | | 70,000 | |
| 39 | VNC POLYESTER FIBER CO.,LTD | Quang Ninh | | | | PET | | 65,000 | |
| 40 | Vinatic Co., Ltd Hai Phong | Hai Phong | x | | | PE | | 57,367 | |
| 41 | NB40:F54am Vang Ha Nam JSC | Ha Nam | x | | | PE, PS, PVC | | 45,900 | |
| 42 | Thuy Anh Import Export Service And Trading Investment JSC | Hai Phong | x | | | PE, PS | | 45,000 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 43 | Lien Minh Import, Export Trading Service Co., Ltd | Hai Phong | x | | | PE, PS, PVC | | 43,200 | |
| 44 | Trinh Nghien JSC | Nam Dinh | x | | | PE, PS, PVC | | 39,000 | |
| 45 | Lam Tran Plastic Co., Ltd | Long An | | | x | PE | | 38,600 | |
| 46 | Doanh Nhuan Plastic Production Co., Ltd | Long An | | | x | PE | | 36,268 | |
| 47 | Thuan Co, Ltd | Hochiminh | | | x | PE, PP | | 35,618 | |
| 48 | Branch of Lien Minh Import, Export Trading Service Co., Ltd in Long An | Long An | | | x | PE, PS | | 33,000 | |
| 49 | Vietnam Lee & Man Paper Manufacturing Co., Ltd | Hau Giang | | | x | Packaging paper | 420,000 | 525,000 | |
| 50 | Cheng Loong Binh Duong Paper Co.,Ltd. | Binh Duong | | | x | Packaging paper | 350,000 | 210,000 | |
| 51 | Sai Gon Paper JSC | Ba Ria Vung Tau | | | x | Packaging paper | 273,000 | 100,000 | |
| 52 | VinaKraft Paper Co., Ltd | Binh Duong | | | x | Packaging paper | 243,500 | 537,700 | |
| 53 | Dong Hai Ben Tre JSC | Ben Tre | | | x | Packaging paper | 180,000 | 48,500 | |
| 54 | An Hoa Paper JSC | Tuyen Quang | x | | | Pulp and printing paper | 140,000 | | N/A |
| 55 | Tan Mai Group JSC | Dong Nai | | | x | Printing paper | 140,000 | | 90,000 |
| 56 | Bai Bang Paper JSC | Phu Tho | x | | | Printing paper | 152,000 | | 61,000 |
| 57 | Vietnam Paper Corporation | Hanoi | x | | | Printing paper | 152,000 | 30,000 | 112,000 |
| 58 | Viet Tri Paper JSC | Phu Tho | x | | | Packaging and printing paper | 80,000 | 65,000 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 59 | An Binh Paper JSC | Binh Duong | | | x | Printing paper | 75,000 | 57,600 | |
| 60 | Hapaco Corporation | Hai Phong | x | | | Kraft, Joss and Tissue paper | 60,000 | | |
| 61 | Dong Tien Paper and Packaging Co., Ltd | Hochiminh | | | x | Packaging | 50,000 | | |
| 62 | Phu Giang Paper and Packaging Co., Ltd | Bac Ninh | x | | | Packaging | 50,000 | 16,000 | |
| 63 | Xuong Giang Paper Mill | Bac Giang | x | | | Printing and tissue paper | 46,000 | | |
| 64 | Hoang Van Thu Paper JSC | Thai Nguyen | x | | | Packaging | 45,000 | 66,000 | |
| 65 | Miza JSC | Hanoi | x | | | Packaging and printing paper | 32,000 | 35,000 | |
| 66 | JP Colerex JSC | Hung Yen | x | | | Toilet and tissue paper | 30,000 | 40,200 | |
| 67 | Van Diem Paper JSC | Hanoi | x | | | Pulp, packaging and printing paper | 30,000 | 30,000 | |
| 68 | Thanh Dung Co., Ltd | Hai Duong | x | | | Pulp and packaging paper | | 76,000 | |
| 69 | Thuan An Production Co., Ltd | Binh Duong | | | x | Pulp and packaging paper | | 66,000 | |
| 70 | Dong Tien Binh Duong Paper Co., Ltd | Binh Duong | | | x | Packaging | | 65,200 | |
| 71 | Dong A Bac Ninh Co., Ltd | Bac Ninh | x | | | Pulp and packaging paper | | 54,000 | |
| 72 | Minh Hung Paper JSC | Binh Phuoc | | | x | Trading paper scraps | | 46,300 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 73 | MUC SON PAPER JOINT STOCK COMPANY | Thanh Hoa | x | | | Packaging | | 45,000 | |
| 74 | Viet My Production and Trading Co., Ltd | Bac Ninh | x | | | Paper | | 43,000 | |
| 75 | Tuan Tai Co., Ltd | Hai Duong | x | | | Trading paper scraps | | 41,040 | |
| 76 | Hung Ha Paper Co., Ltd | Hanoi | x | | | Packaging | | 37,000 | |
| 77 | Lam Son Thanh Hoa Paper JSC | Thanh Hoa | x | | | Pulp and packaging paper | | 22,000 | |

***Table 5. Major stakeholders and location***

### 2.1.6. Waste generation

With a population of more than 90 million, 35% of whom live in big cities, the consumption patterns in Vietnam are changing and the amount of solid waste generated increasing. Figure 1 shows the general composition of solid waste generated in Vietnam. Among those, municipal solid waste accounted for the largest number.

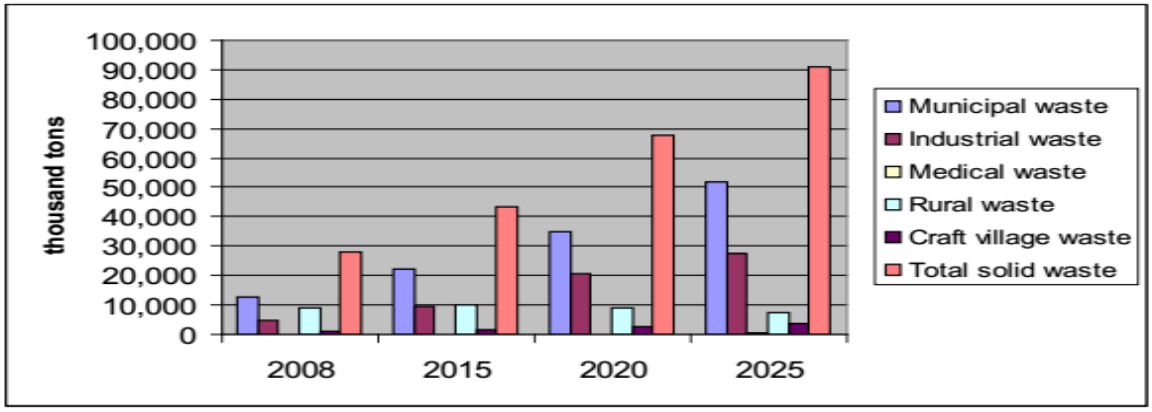



***Figure 9. Waste generation in Vietnam***

*Source: MONRE (2011)*

According to a study conducted by the Ministry of Construction (MOC) in 2014, the generation of household waste in urban areas is around 31,600 tons/day and in rural areas is 31,500 tons/day. Total estimated household waste was about 63,000 tons/day nationwide or nearly 23 million tons/year in 2014. However, more updated data is not available.

***Domestic waste:*** The annual growth rate of Domestic MSW is 11.7% and is presented below.

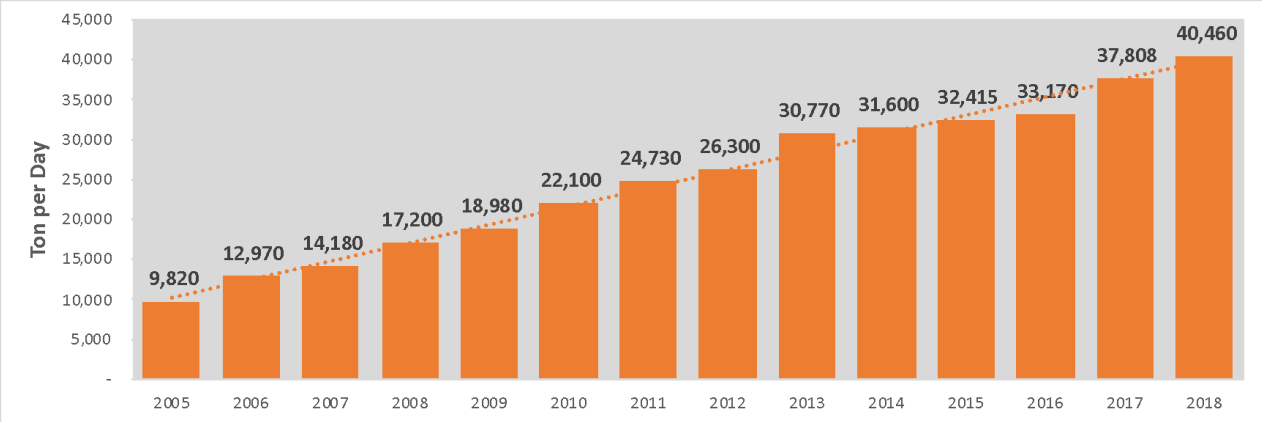



***Figure 10. Domestic Municipal Solid Waste***

*Source: This study*

Sorting of household solid waste has not yet become a popular practice in Vietnam, but rather has only been experimented on household garbage under some pilot projects major cities. With underdeveloped infrastructure and unsystematic management, in many cases, separated wastes have been collected and disposed together, thus reducing the effectiveness of these programs, indicating that people have not taken up the habit of separating wastes. However, households and garbage collectors to sell to recycling craft villages have sorted some recyclable solid waste. Spontaneous sorting of recyclable solid waste is continuously carried out from the originating places to gathering points until final landfills. Cities that have piloted sorting wastes at source such as Ho Chi Minh, Hanoi and Da Nang have yielded results but have not advanced beyond pilot level.

***Figure 11. Sorting waste in a craft village near Hanoi, Vietnam***

***Industrial waste***: most recyclables are sorted right where they are generated for reuse and recycling. As a result, recyclables are used as materials for production in the industries themselves. Other scraps which are non-reusable for such production processes but could possibly be used for secondary production will be gathered and sold to recycling units. The rest will be moved to the waste storage of companies or collecting units to transport to treatment facilities.

***Medical waste:*** In the health sector, most medical solid waste is sorted according to the regulations of the MOH in all central hospitals as around 95% of hospitals have implemented this segregation nationwide (MONRE, 2011).

### 2.1.7. Solid waste composition

The composition of solid waste slightly differs across the regions of Vietnam, with food waste accounting for the highest portion of 50-70% (average: 64.58%), followed by plastics (average: 12.36%), paper (5.05%), and textiles (3.20%). The reason behind the large amount of plastic waste is deemed to be the wide use of nylon bags. According to an interview with URENCO, nylon bags have low commercial value and thus are discarded, instead of being recycled. The table below presents waste composition in urban areas. The current analysis showed no significant change in this composition.

| Material | Hanoi | Hai Phong | Hue | Da Nang | Hochiminh city | Average |
|---|---|---|---|---|---|---|
| Organic waste | 57.30 | 56.37 | 77.10 | 68.47 | 63.67 | 64.58 |
| Paper | 5.95 | 4.98 | 1.92 | 5.07 | 7.34 | 5.05 |
| Wood | 4.57 | 4.32 | 0.59 | 2.79 | 4.39 | 3.33 |
| Plastic | 10.96 | 12.81 | 12.47 | 11.36 | 14.19 | 12.36 |
| Leather & rubber | 0.18 | 1.48 | 0.28 | 0.23 | 0.69 | 0.57 |
| Metal | 0.56 | 0.36 | 0.40 | 1.45 | 0.48 | 0.65 |
| Glass | 3.47 | 1.52 | 0.39 | 0.14 | 0.63 | 1.23 |
| Ceramic | 0.82 | 0.86 | 0.79 | 0.79 | 0.76 | 0.80 |
| Oil & sand | 5.86 | 3.02 | 1.70 | 6.75 | 1.84 | 3.83 |
| Coal slag | 2.72 | 5.88 | 0.00 | 0.00 | 0.42 | 1.80 |
| Hazardous waste | 0.49 | 0.05 | 0.00 | 0.02 | 0.04 | 0.12 |
| Sludge | 2.98 | 2.15 | 1.46 | 1.35 | 2.41 | 2.07 |
| Other | 0.31 | 2.50 | 0.00 | 0.03 | 0.09 | 0.59 |
| **Total** | **100** | **100** | **100** | **100** | **100** | **-** |

***Table 6. Solid waste composition in major cities of Vietnam (%)***

*Source: MONRE (2011)*

### 2.1.8. Solid waste collection and transportation

According to the National Environment Report 2011-2015, the rate of household solid waste collection in urban areas reached an average of 84-85%. This rate is rising in accordance with the grade of cities. The lowest rate is at cities under grade IV with an average collection rate of 65%, and the highest one belongs to Hanoi city (special city) with 98% (MONRE, 2015). Waste collection is usually implemented by URENCO companies but also private companies, particularly in major cities. In Hochiminh City, for example, private companies collect 50% of generated waste volume. In rural areas, the collection rate is 40-55% depending on localities. In small towns, the rate could reach 60-80% while in remote mountainous areas it is below 10%. In rural areas, household solid waste is usually collected by an environmental sanitation team for each hamlet. In some localities, private companies also participate in collecting and treating solid waste (Tien N.H, 2014).

Solid waste sorting at source has not been widely carried out in Vietnam; therefore, in most urban areas only unsorted wastes are collected. There are two forms of waste collection: basic waste collection (people put wastes in boxes/packages which are then picked up by street cleaners with small rubbish carts) and secondary waste collection (street cleaners put municipal wastes in rubbish carts, take them to garbage compress trucks, and transport them to treatment areas or rubbish containers in markets/residential areas.
Hochiminh City has two major transfer stations: Quang Trung transfer station receives 1,084 tons/day; Tong Van Tran transfer station receives 820 tons/day. Rubbish from these transfer stations are taken to Da Phuoc and Phuoc Hiep solid waste treatment complexes and Vietstar rubbish treatment plant.

Urban areas currently don't have rubbish transfer sites for solid waste collection. Hanoi does not have any rubbish transfer site while the distance between Hanoi and Nam Son landfill is around 50 km. Other cities don't have any rubbish transfer site like in Hochiminh City. Most urban areas have only rubbish rally sites, which fail to meet standards on environmental sanitation.

Solid waste collection and transportation are being socialized in several areas. Only in city-level urban areas does URENCO collect, transport and treat MSW. However, joint stock or private companies are also involved in the work. In Hanoi, in addition to URENCO, which plays the key role, nearly 30 private and collective units take part in collecting, and transporting municipal wastes.
In town-level urban areas, only cooperatives, private organizations are responsible for collecting and transporting wastes with fees negotiated with local people under the guidance of local administrations.

The waste management flow in Vietnam can be described in the Figure below.

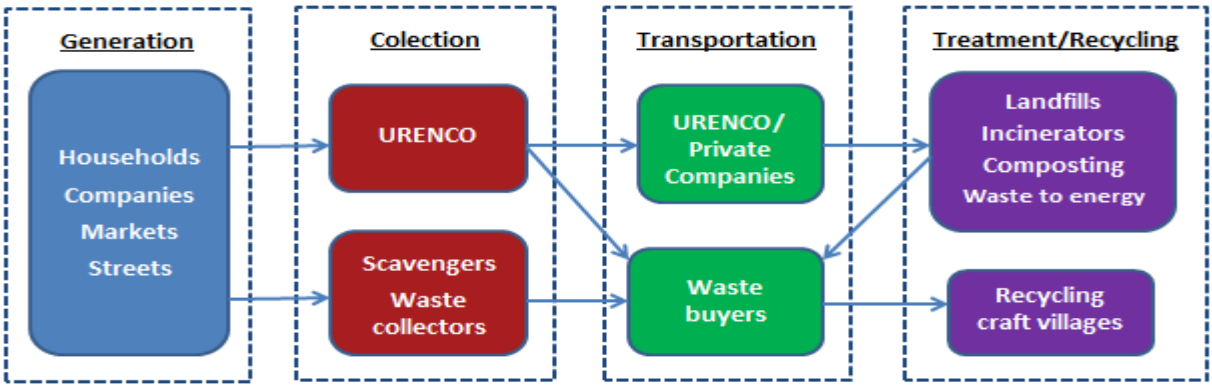



***Figure 12 Waste flow in Vietnam***

*Source: Adapted from VEPR (2015)*

### 2.1.9. Recycling

There is still no official, consistent and scientifically based data regarding the recycling rate of any kind of waste at a national level in Vietnam. However, the National Environment Report 2011 estimated the recycling rate of municipal solid waste at around 8-12% by volume. This recycling activity is implemented mainly by the informal sector in craft villages (MONRE, 2011). According to a 2011 JICA study, materials that typically are recycled are papers, plastics and metals, and the recycling rate is around 8.2%. These recyclables are usually collected by waste scavengers and transported to recycling craft villages. About 90% of them are transformed into plastics, paper, and metal products while 10% becomes waste after recycling (MONRE, 2011).

The amount of recycled paper scrap and plastic scrap in 2018 were 1,602 tons and 700-1000 tons respectively according to the VPPA and VPA.

Recycling technologies in craft villages are mainly manual and outdated, causing serious environmental pollution. In addition, wastes from craft villages are not treated but dumped directly into the environment with municipal wastes and taken to landfills.
Recycling technologies in craft villages are mainly manual and outdated, causing serious environmental pollution. In addition, wastes from craft villages are not treated but dumped directly into the environment with municipal wastes and taken to landfills. Many recycling establishments are not located in craft villages but in urban areas. Hochiminh City has 302 recycling establishments in the city, mainly in district 11. Of these establishments, 67 recycle plastics, 15 recycle crystal, 9 recycle metals, 7 recycle paper, and 2 recycle rubber (Source: Hochiminh city DONRE, 2006).

### 2.1.10. Major waste treatment

In Vietnam, waste treatment methods can largely be divided into landfilling, composting, incineration and recycling. More recently, a much broader concept of thermal treatment technology was introduced in place of incineration to include waste-to-energy technologies such as pyrolysis and gasification. Application of these are not known.

#### *2.1.10.1. Landfilling*

According to the National Environment Report in 2011, landfilled solid waste accounted for 76-82% of collected waste, of which about 50% was controlled landfill and 50% uncontrolled (MONRE, 2011). The study conducted by MOC/JICA in 2018 on solid waste in Vietnam (Tran Khanh Long, 2019) showed that the percentage of landfilled domestic solid waste in Vietnam is about 76.4% of collected waste, while 24.6% has been either recycled, composted or incinerated.

This means, with 40,460 tons per day of collected domestic MSW in 2018, the amount of plastic waste and paper waste in landfills were 1,380 tons and 564 tons respectively (76.4% of collected waste is landfilled, of that, 12.36% is plastic and 5.05% is paper).

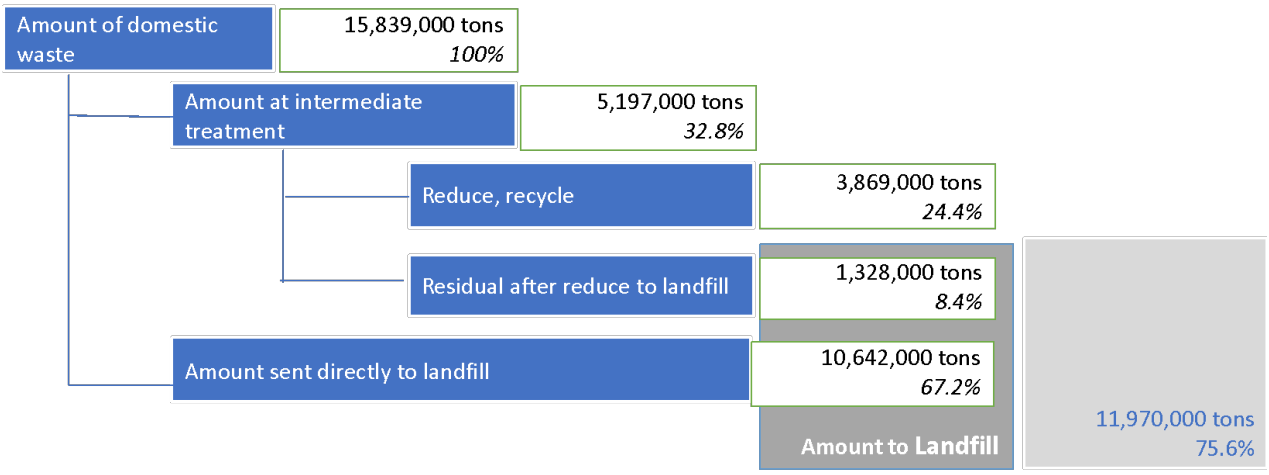



***Figure 13. Domestic solid waste flow in Vietnam***

*Source: MOC (2019)*

### *2.1.10.2. Composting*

As reported by MONRE (2011), around 60-65% of urban solid wastes are food wastes, which are easy to turn into compost. However, because organic wastes, from which compost can easily be produced, are not discharged or inputted separately into the compost production facilities, approximately 35-40% of the solid waste input become residual by-products that must be disposed of in landfills. Most composting plants have not been operating at full capacity. Some plants have even stopped operations due to difficulties related to capital, production technology and markets. The lack of at-source separation of waste materials leads to low-quality compost products that don't meet local requirements. Production costs are high while product price remains low. Consequently, the market for compost is still very limited. Neither plastic nor paper waste was used as materials for composting.

### *2.1.10.3. Incineration*

According to JICA study (Wada H., 2016) there are 44 incinerators nationwide. These burning technologies with different scales from 10 tons/day to 150 tons/day have been applied in some localities - particularly in cities, in densely populated urban areas or districts, and in communes. The advantage of this method is that waste is treated thoroughly. The method eliminates the possibility of polluting waste, reducing the volume and weight of waste to a minimum. It also spares the land the impact of treatment facilities; shortens the processing time; and enables the recovery of thermal energy. Neither plastic nor paper waste were used as materials for incineration. Incineration can be polluting if emissions are not well scrubbed and residual ash is not disposed of properly.

#### *2.1.10.4. Waste-to-energy*

Until 2016, there was only one waste incineration for electricity plant in Nam Son, Hanoi, with capacity of 20MW and 75 tons of waste per day. This plant treats only industrial and hazardous waste. In late 2017, Can Tho operated the first domestic waste incinerator with a capacity of 7.5MW and of 400 tons of waste per day. The most popular waste-to-energy method in Vietnam is biogas production from husbandry. There are around 500,000 biogas tanks nationwide, mainly in rural areas at the household scale with volume below 10m3. These small biogas tanks are usually used for cooking and lighting in households but are not yet applied for electricity production. Only a few modern cities collect methane and other gases from dumping sites. A number of provinces are considering waste to energy as an option from landfill. However, plastic incineration is not yet considered.

### 2.1.11. Cost of waste disposal

The costs of solid waste disposal vary from region to region and depend on treatment technology and capacity. The standard cost for solid waste treatment issued by MOC served as a basis for local authorities and a waste treatment company to design the pricing mechanism for the treatment. It is shown in table 2.

| Treatment capacity (ton/day) | Treatment cost (Mill VND/ton/day) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Composting | | Incineration | | Combined composting and incineration | | Landfilling | |
| | Imported technology | Domestic technology | Imported technology | Domestic technology | Imported technology | Domestic technology | With depreciation | Without depreciation |
| <50 | | | 0.34 | 0.32 | | | | |
| 50-100 | | | 0.50 ÷ 0.48 | 0.47 ÷ 0.44 | | | 0.14 | 0.13 |
| 100-300 | 0.34 ÷ 0.30 | 0.30 ÷ 0.25 | | | 0.41 ÷ 0.37 | 0.38 ÷ 0.34 | 0.14 ÷ 0.12 | 0.13 ÷ 0.11 |
| 300-500 | 0.30 ÷ 0.26 | 0.25 ÷ 0.22 | 0.48 ÷ 0.45 | 0.44 ÷ 0.39 | 0.37 ÷ 0.33 | 0.34 ÷ 0.30 | 0.12 ÷ 0.10 | 0.11 ÷ 0.09 |
| 500-800 | 0.26 ÷ 0.22 | 0.22 ÷ 0.20 | 0.45 ÷ 0.41 | 0.39 ÷ 0.35 | 0.33 ÷ 0.29 | 0.30 ÷ 0.26 | | |
| >1,000 | | | | | 0.29 ÷ 0.25 | 0.26 ÷ 0.22 | 0.0 | 0.09 |

***Table 7. Cost of solid waste treatment***

*Source: Adapted from Decision No.1354/QD-BXD dated December 29th, 2017 of the MOC on announcement of investment rates and standard costs of treatment of municipal solid waste*

Table 3 provides a summary of the cost of waste disposal in some major cities of Vietnam. In the case of Hanoi, waste treatment service providers were paid around VND69,000 per ton for disposal at a landfill and VND330,000-380,000 per ton for incineration.

| | Location | Company | Price (VND/ton) | Daily Capacity | Treatment Technology |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 1 | Hanoi | Nam Son landfill | 69,000 | 5,000 | Landfill |
| | | Xuan Son landfill | 69,000 | 250 | Landfill |
| | | Thanh Cong collective | 330,000 | 200 | Incineration |
| | | Thang Long company's incinerator | 380,000 | 700 | Incineration |
| 2 | Hochiminh city | Da Phuoc waste company | 433,560 | 3,000 | Landfill |
| | | Tam Sinh Nghia | 438,170 | 1,000 | Incineration |
| | | Vietstar | 408,500 | 1,200 | Incineration |
| | | CITENCO 3 landfill | 360,000 | 2,000 | Landfill |
| 3 | Da Lat | Xuan Truong disposal plant | 129,000 | 150 | Incineration |
| 4 | Bac Ninh | Phu Lang disposal plant | 330,000 | 200 | Incineration |
| | | Hung Phat Environmental Company | 400,000 | 300 | Incineration |
| 5 | Lang Son | Van Lang disposal plant | 91,143 | 50 | Incineration |

***Table 8. Cost of waste disposal***

*Note: Exchange rate US$1 = VND 23,250*
*Source: Collected by the team*

Apart from waste treatment cost the waste generator should also bear a cost for waste collection and transportation to the waste treatment places. The solid waste transport and collection fee depends on the distance, and is between VND 30,000-50,000 per ton. The solid waste disposal service contracts are renewed every five years, while the contract on the transport fee is renewed every year. Table 4 summarizes the solid waste transport fee in some major cities of Vietnam.

| | Location | Criteria | Unit price (VND) | Note |
|---|---|---|---|---|
| 1 | Hochiminh city | Normal truck with capacity of 10 tons per time | 196,669 per trip | |
| 2 | Hanoi | For household (HH) | 3,000- 6,000 per HH per month | Decision No.54/2016/QD-UBND |
| | | Commercial HH with waste volume <1m3 | 90,000-130,000 per HH per m | |
| | | Commercial HH with waste volume <1m3 | 208,000-500,000 per HH per m | |
| | | Organization with waste volume <1m3 | 130,000 per organ per m | |
| | | Organization with waste volume <1m3 | 208,000-500,000 per organ per m | |
| | | Others | 208,000-500,000 per organ per m | |
| 3 | Lang Son | Trip based fee | 160,000 per trip | Decision No. 1009/QD-UBND |
| 4 | Bac Ninh | Normal truck with capacity of 10 tons per time | 187,886 per trip | Decision No. 745/QD-UBND |
| | | Normal truck with capacity of 5 tons per time | 211,192 per trip | |

***Table 9. Solid waste transport fee in some major cities of Vietnam***

*Source: Collected by the team*

## 2.1.12. Materials and material flow

### *2.1.12.1. Plastic sector*

In 2018, the plastic sector produced 8.3 million tons of resin and semi-finished and final plastic products. The sector consumed an estimated 8.5 million tons of resins and scrap. Of that, the country can only provide 1,000 tons of resin and 700-1000 tons of plastic scrap. The rest was imported. Resin is the major source for production. The produced resin is served for only a certain domestic demand, such as 15% PP's demand, 30% PET's demand and 50% PVC's demand. There were 5.59 million ton of plastic raw materials imported in 2018, mainly PE (30%), PP (24%), PET (8.4%) and PVC (7.8%)[10]. The volume and values of imported resin is summarized below.

| | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| Quantity (1000 ton) | 2,491 | 3,454 | 3,923 | 4,605 | 4,931 |
| Value (1 million USD) | 5,760 | 6,316 | 5,961 | 6,283 | 7,355 |
| Average price (Million USD/1000 ton) | 2.31 | 1.83 | 1.52 | 1.36 | 1.49 |

***Table 10. Volume and values of imported resin for plastic production***

*Source: VPA, 2018*

796,680 tons of plastic products and semi-finished products such as plates, sheets, film, foil, tubes, tableware, kitchenware, bath, and shower-baths were also imported in 2018.

| | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| Quantity (1000 ton) | 397 | 478 | 570 | 678 | 769 |
| Value (1 million USD) | 2,753 | 3,138 | 3,782 | 6,397 | 5,408 |
| Average price (Million USD/1000 ton) | 6.93 | 6.56 | 6.64 | 9.44 | 7.04 |

***Table 11. Volume and values of imported plastic products and semi-finished products***

According to MONRE, about 20 companies have license to import plastic scraps... In 2018, 615,000 tons of plastic scraps were imported in Vietnam[11].

Recycling plastic scrap occupies only a small part in the whole value chain.

[10] VPA, Plastic Industry Report 2018

[11] https://www.customs.gov.vn

| Category | | International (import – export) | Domestic | TOTAL |
|---|---|---|---|---|
| **Input** | | **7312** | **2,000** | **9,312** |
| | Resin | 5900 | 1,000 | 6,900 |
| | Imported product/semi-finished product | 797 | | 797 |
| | Recycled scrap | 615 | 700-1,000 | 1,615 |
| **Product** | | **4610** | **3,690** | **8,300** |
| | Resin | 807 | | 807 |
| | Plastic product/by product | 3,803 | 3,690 | 7,439 |
| **Waste to recycle** | | | **1,000** | **1,000** |
| | Recycled scrap | | 700-1,000 | 700-1000 |
| **Waste to disposal** | | | | **2,110** |
| | Landfill | | 1,380 | 1,380 |
| | Disposed to ocean | | 730 | 730 |
| **Balance (In - Out)** | | | | (2,098) |

***Table 12. Material flow of plastic sector (1000 tons)***

*Source: VPA, this study*

The above table showed a negative balance of 2.1 million tons between inputs and outputs. This may be caused by a missing import record or excessive estimation of waste. However, even when the waste volume is reduced, the balance remains negative. This means ***the inputs values for plastic sector was not properly registered.***

### *2.1.12.2. Paper sector*

Vietnam currently can only partly meet the pulp demand, so the paper industry is dependent on imported pulp. Scrap papers are increasingly used as input material for the paper industry due to its low cost. Production cost of pulp made from scraps is often lower than that made from traditional materials owing to cheaper transportation, collection and treatment costs. According to VPPA, scrap paper currently accounts for 70% of the total production of Vietnam's paper industry. Some types of paper products use scrap paper materials as input materials accounting for 85-90%, even up to 100%. Scrap paper is used to produce recycled pulp, mainly for the production of packaging paper.

Currently, packaging paper is the main product of Vietnam's paper industry, accounting for nearly 70% of total industry consumption. The average growth rate is 15.8%/year. The combination of virgin pulp (made from wood 100%) and recycled pulp allows the production of a wide range of paper products such as paper printing, paper writing, paper boxes, packaging paper, and paper towel (VPPA, 2018). Compared to traditional material pulp, recycled pulp has lower quality, thus it cannot be used for products such as packages of high durability and persistency. Scraps come from two sources: (i) domestic collection and (ii) imports. Imported scraps are mostly from the US, Japan and New Zealand. Domestic collection is mainly for

scrap-iron dealers, who go to every corner for small transactions, sanitary companies, wastage-seeking people and intermediation trade centers.

In 2018, the paper sector produced 3.7 million tons of semi-finished and final paper products and 185 tons of pulp from 4.2 million tons of pulp and paper scraps. 57% of materials were imported.

| (per 1000 tons) | | **2015** | **2016** | **2017** | **2018** | **2022** | **2026** | **2030** |
|---|---|---|---|---|---|---|---|---|
| Recycled paper | Collected domestically | 965 | 1066 | 1372 | 1602 | 3184 | 5218 | 6420 |
| | Imported | 810 | 832 | 1356 | 2069 | 5195 | 7827 | 9630 |
| | Total input to production | 1775 | 1898 | 2728 | 3671 | 8379 | 13045 | 16050 |
| Pulp | Domestic production capacity | 200 | 200 | 200 | 200 | 420 | 1550 | 2500 |
| | Domestic Production | 442 | 473 | 494 | 524 | 700 | 1000 | 1230 |
| | Domestic Consumption | 152 | 175 | 180 | 185 | 380 | 1400 | 2400 |
| | Imported | 290 | 298 | 314 | 339 | 320 | 180 | 220 |
| | Exported | | | | | 0 | 580 | 1390 |
| Paper | Domestic Production capacity | 2345 | 2420 | 3773 | 5109 | 8722 | 13525 | 15456 |
| | Domestic Production | 3506 | 3797 | 4265 | 4946 | 7695 | 10474 | 13318 |
| | Domestic Consumption | 1392 | 2506 | 2810 | 3674 | 7671 | 11798 | 14495 |
| | Imported | 1737 | 1898 | 1962 | 2088 | 1803 | 1768 | 2007 |
| | Exported | 155 | 158 | 498 | 809 | 1779 | 3092 | 3184 |

***Table 13. Overview of material consumption in paper sector***

Paper scrap is the major source for production, counting to 88% of materials in 2018. It is expected to increase to 93% by 2030. The volume of waste paper collection increased over the year and meets around 40% of material demand.
Pulp demand is 12% of the needs. Certain types of pulp - BCTMP, BSKP and UKP - need to be imported.

| **(per 1000 tons)** | | **International (Import – Export)** | **Domestic** | **TOTAL** |
|---|---|---|---|---|
| **Input** | | **4496** | **1787** | **6283** |
| | Pulp | 339 | 185 | 524 |
| | Scrap paper | 2069 | 1602 | 3671 |
| | Imported paper | 2088 | | 2088 |
| **Product** | | **809** | **3050** | **3,859** |
| | Paper | 809 | 2865 | 3674 |
| | Pulp | 0 | 185 | 185 |
| **Waste to recycle** | | | | **1,602** |
| | Recycled scrap paper / pulp | | 1,602 | 1,602 |
| **Waste** | | | | **677** |

| | | | | |
|---|---|---|---|---|
| | Disposed | | 564 | 564 |
| | Uncollected | | 113 | 113 |
| **Balance (In – out)** | | | | 145 |

***Table 14. Material flow in paper sector***

| Input | Unit | Wrapping paper | Votive paper | Kraft paper | Tissue and toilet paper |
|---|---|---|---|---|---|
| 1. Wastepaper (and bamboo) | kg | 1200-1300 | 1200-1300 | 1200-1300 | 1200-1300 |
| 2. Pine resin | kg | 30-40 | 30-40 | 0 | 50-60 |
| 3. Javen | lit | 0 | 15-30 | 0 | 20-50 |
| 4. Alum | kg | 40-50 | 40-50 | 40-50 | 40-50 |
| 5. Pigment | kg | 0 | 3-5 | 0 | 3-7 |
| 6. NaOH | kg | 5-6 | 5-6 | 5-6 | 6-8 |
| 7. Coal | kg | 500 | 600 | 700 | 600 |
| 8. Water | m3 | 50-100 | 60-120 | 50-100 | 75-150 |
| 9. Electricity | kw | 280-300 | 280-300 | 280-300 | 280-300 |

***Table 15. Inputs for paper production in paper craft village in Vietnam***

*(Average for 1 ton of paper product)*
*Source: Nguyen Mau Dung (2010)*

## 2.2. Analysis of interviews and surveys

The primary data for the study came from two sources: the field survey and face-to-face in-depth interviews with relevant actors and stakeholders in recycling industry.

### 2.2.1. The survey

The survey was conducted with 2,787 samples, randomly taken from national statistical database and 9 related Ministries, NGOs and Associations. The sample size per target group and response is presented below.

| Sector | Group 1 (Consumers) | | Group 2 (Producer) | | Group 3 (Waste services) | | Total | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | Sample | Response | Sample | Response | Sample | Response | Sample | Response | |
| **All** | **851** | **103** | **1342** | **171** | **680** | **69** | **2787** | **312** | 29 respondents with more than 1 roles, 94 dealing with plastic and paper |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Paper | 0 | 96 | 522 | 100 | 105 | 43 | 547 | 228 | 10 respondents with more than 1 roles |
| Plastic | 0 | 67 | 820 | 73 | 253 | 60 | 1067 | 187 | Rubber and plastic is categorized the same sector, thus high volume of samples 21 respondents with more than 1 roles |
| Other | 851 | | 0 | | 0 | | 851 | | Distributed under paper and plastic sector |

***Table 16. Sampling and response of the survey***

The survey received responses from 312 entities, including 103 consumers, 171 producers and 69 waste service providers (amongst them 29 have more than one role in material flow). It is estimated that a bias of ±11% (precision 95%) is applied for this research. The number of producers in the plastic and paper sectors is estimated at 1,200 and 2,400 (statistics 2015).

Below are key findings of the survey.

#### *2.2.1.1. The survey respondents*

The respondents mainly come from the private sector (63%) and FDI (25%), large (25%) and small size (41%), and more than 5 years of establishment (83%). These ratios from respondents in the plastic and paper sectors are similar and match the characteristic of the sectors.

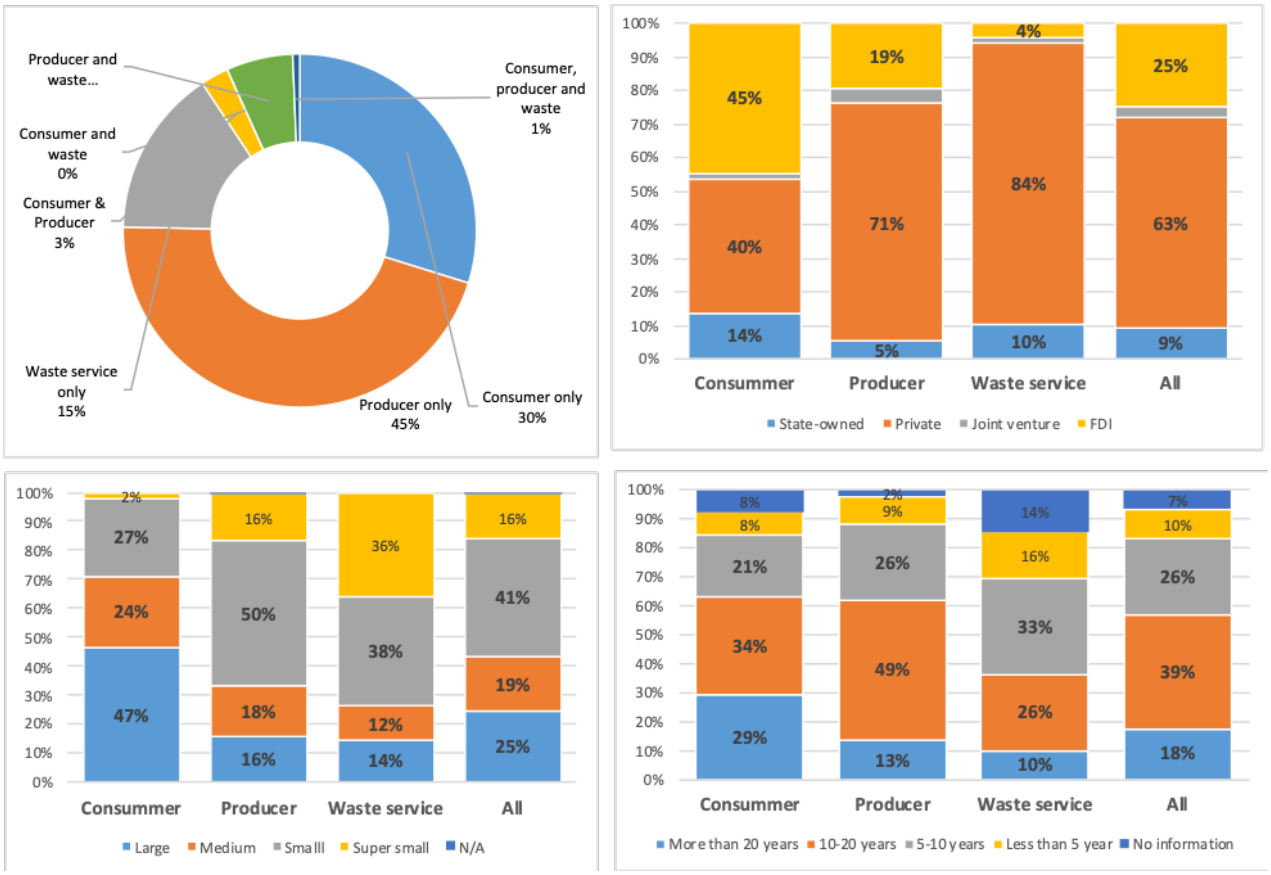



***Figure 14. Characteristics of survey respondents***

With the characteristics of long experience in business and not under state-owned management, the material flow, including recycle material flow, could be strengthened with market mechanisms rather than regulatory controls. Although the small size of the sector plays a significant role in both the plastic and paper sectors, **in order to secure resources and commitment to participate in the material market, the starting phase should be with large scale (with some extension to medium)**, then independent from the size.

### *2.2.1.2. The response to material market development*

The survey found positive responses (74% of respondents) on the development of Vietnam material market place. 37% of respondents expressed interest in engagement with the market. These rates from respondents in the plastic sector (83% and 49%) are higher than those in paper sector (72% and 37%).

Along with the value chain of materials, more respondents from production and waste service provided support to the development of market than those from

consuming group. Aside from especially high interest among large producers (77%) in the material market, the interest of respondents is independent from the size of operation.

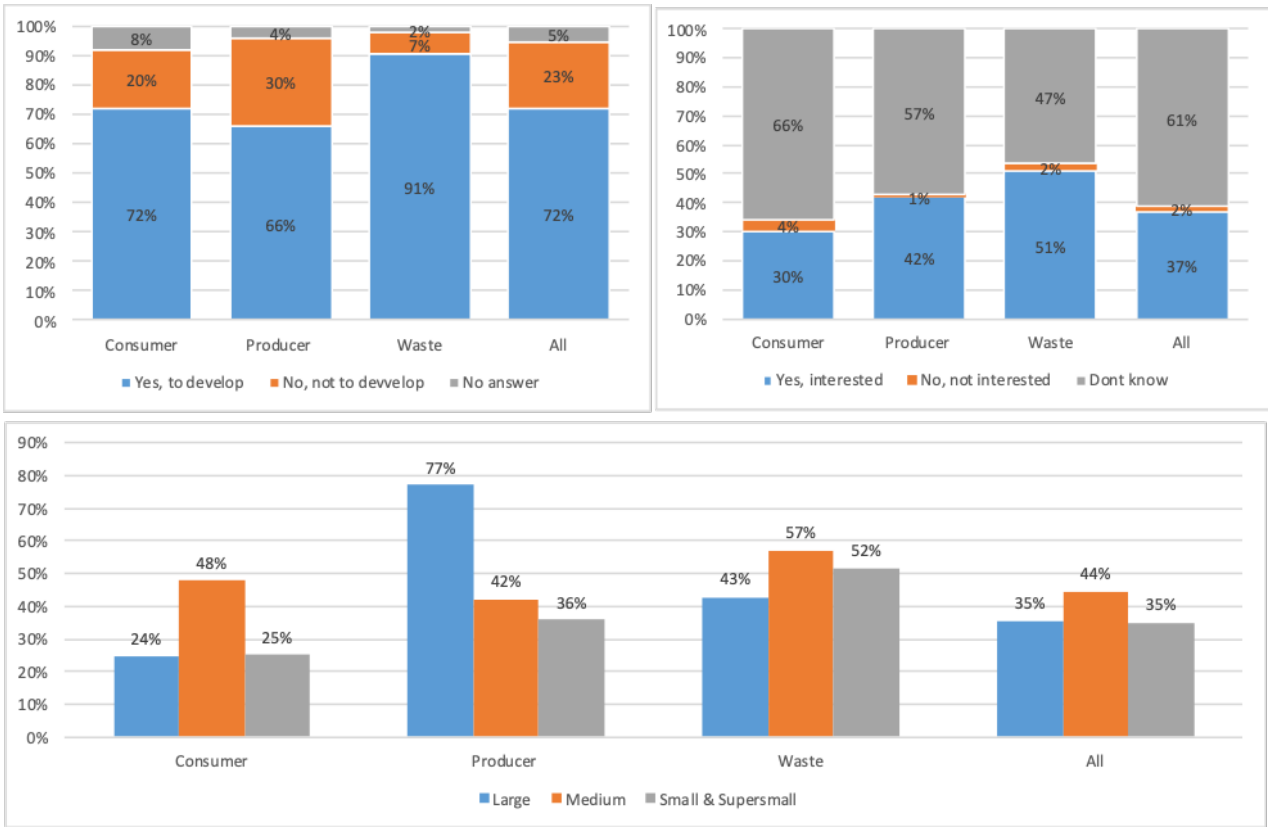



***Figure 15. Response to market development and interest in material market***

Although only 5% of respondents could not answer whether the material market should be developed for Vietnam, the survey showed 61% of respondents uncertain whether they are interested. In order to attract sufficient numbers of participants to the materials market, it is important to start with a strong **awareness campaign, particular to consumer groups**. The reasons for the above results are listed below.

| Question | All answers |
|---|---|
| Reasons for development of Vietnam material market | **Pressure to solve**<br>· Very limited provider can purchase medical waste<br>· Long degradation time with lots of waste, thus need a market to make use of this scrap<br>· Need a master plan for recycle, reduce self-recycle initiatives<br>· PP is not yet considered as supporting industry for plastic sector<br>· Human needs plastic, but better social security<br>· It is a must to reduce exploitation of natural resources and pressure of environmental treatment<br>· It is necessary because there is no common market in Vietnam, while China takes advantage of Vietnam to buy scraps, leading to enterprises in Vietnam depending on Chinese prices.<br>· Due to demand of enterprises and environmental protection<br>· Utilize scraps<br>· To serve current demand<br>· Vietnam market needs recycling materials, if not, it will be competed with foreign countries<br>· Excessive disposal, small purchases<br>· Vietnam has too much waste which should be collected and recycled<br>· Scrap in Vietnam is plenty, needs to collect and process. Need to build the market to utilize scrap<br>· Paper is much discharged, affecting the environment<br>· Pollution of plastic waste is increasing<br>· It is necessary to exchange and trade raw materials<br><br>**Expectation from market**<br>· Establishment of scrap purchasing system<br>· This will be a platform for buyer and seller<br>· The market and managing mechanism will prevent secondary pollution<br>· Better control, supply for production and reduce waste to environment<br>· Minimize plastic waste everywhere<br>· Market is opportunity to control types, cost and price<br>· Easier to access, less discharge to environment, cheaper<br>· A reliable source for recycle and recovery<br>· Buyer, seller and intermediate<br>· To treat environmental discharge in the country<br>· Higher collection rate, lower environmental pollution<br>· Independent from material source, stable market<br>· Strong development of paper and plastic sectors<br>· The purpose is to manage the market comprehensively and sustainably, avoiding spontaneous business activities, affecting the environment<br>· Should build to exploit benefits of scraps and aim to build green living environment<br>· With this market we can take advantage of collecting and recycling scraps<br>· Market should be built to manage plastic waste and waste and to support true production facilities<br>· To reduce paper waste mixed with other waste<br>· Advantages for the exchange and sale of raw materials<br>· Price will be public and transparent<br>· Businesses are very supportive if there is a common market<br>· Because easy to buy<br>· To reduce competition with foreign countries and to reduce costs<br>· Low cost, collecting waste to protect environment<br>· Reduce waste to environment<br>· Environmental protection, cheaper raw material prices, limit plastics to the environment<br>· Cleaner environment<br>· Should be built to limit plastic waste discharged into the environment<br>· Utilize more domestic scrap<br>· Utilize scraps, bring economic benefits<br>· Contribute to protect the environment. However, it is necessary to implement methodically, seriously, and mobilize capital to maintain the market<br>· For green environment<br>· Saving energy for the country<br>· To reduce environmental impact |

| | |
|---|---|
| | · Reduce environmental pollution<br>· To protect environment<br>· To protect environment<br>· Environmental protection<br>· Environmental protection, utilize reusable waste sources<br>· Create common market<br>· Recycling and treating waste in the environment, reducing pollution<br>· Reduce environment pollution<br>· Yes, it is very good<br>· Contribute to environmental protection, create an intermediary place for trading<br>· Cleaner environment<br>· Develop scrap market for a cleaner environment<br>**Expectation beyond scope of market**<br>· Should be built to treat persistent plastic waste<br>· Develop legal regulations and convenient transportation methods<br>· Classify waste at source, limit paper and plastic discharged into household waste<br>· Safe for environment<br>**Unclear to classify**<br>· Need to integrate treatment function for scrap and waste<br>· MONRE<br>· Very necessary |
| Reason for not develop Vietnam material market | · Impossible to perform waste control in Vietnam<br>· Need a good management, it does not matter if the source is from the country or import to ensure environmental protection |

| | |
|---|---|
| Market developer and leader | · Association of production manufacturers<br>· Authority<br>· Authority state agencies<br>· Authority state agencies<br>· Companies and national and international partners<br>· DOIT<br>· DONRE<br>· Enterprise<br>· Enterprise<br>· Enterprises competitor<br>· Environmental and tax agencies at local level<br>· Functional agency of state, which is public and transparency<br>· Governmental management agency<br>· Government and enterprise<br>· International technology and state facilitates<br>· Join-venture and private companies which have experience in recycling<br>· Legal organization, MONRE<br>· Management levels adopt policies to support and regulate the market.<br>· MOIT<br>· MOIT<br>· MOIT<br>· MOIT, MONRE<br>· MOIT, MOST, MONRE, enterprises<br>· MONRE<br>· MONRE<br>· MONRE<br>· MONRE<br>· MONRE<br>· MONRE, VEA<br>· Not clear<br>· only private company<br>· Private<br>· Private Corporation<br>· Private is the best<br>· Private organization<br>· Relating ministries and industries<br>· State<br>· State<br>· State<br>· State<br>· State<br>· State<br>· State develops and manages<br>· State develops and manages<br>· State management agency<br>· State supervises, units with sufficient capacity manage<br>· State, enterprise<br>· The State builds, guides and regulates establishments to respond to production and purchasing units.<br>· To be free according to the market economy. Only applicable for usable recyclable materials<br>· VCCI, government, MOIT, MONRE<br>· Vietnam Packaging Association<br>· Vietnam Printing Association and DONRE |

| | |
|---|---|
| Participants of the market | · All industry<br>· All plastic production units should have waste recycling machine which is cheap (about USD 650/pcs), to self-recycling plastic generated during production, easy to sell with higher price in comparison with raw scraps<br>· Being professional from the year 27<br>· Domestic enterprise<br>· Domestic private company<br>· Enterprises produce and consume paper and plastic<br>· Environment<br>· Environment, custom<br>· Environmental and tax agencies<br>· Environmental management agencies<br>· FDI<br>· It is necessary to have agency to manage and supervise market<br>· Leaders of DONREs<br>· Manufacturers directly produce products<br>· Ministries, agencies relating on plastics, manufacturing enterprises, people<br>· MOIT, enterprises<br>· MOIT, MOF, VCCI, etc.<br>· MOIT, MONRE<br>· MONRE<br>· MONRE<br>· MONRE<br>· MONRE<br>· MONRE, MOIT<br>· MONRE, MOIT, user, waste owner and treatment and recycling agencies<br>· MONRE, VPA<br>· MONRE: Evaluating and controlling environmental impacts<br>· MOST: Identification of recycled materials and recycling methods.<br>· Not clear<br>· Plastic enterprises, MONRE, DONRE, custom and tax agencies<br>· Printing and paper packaging units<br>· Private company<br>· Private company<br>· Production and Trading<br>· Recycling enterprises, enterprises in plastic and paper industry and users<br>· Relating agencies, Vietnam Plastic Association<br>· Relating to paper industry<br>· State<br>· State agency<br>· State, enterprise<br>· State, production units and purchasing units<br>· The company will participate in segregation, collection, transportation and treatment of waste<br>· Units have the function of collecting and treating recycled waste<br>· Units produce and consume paper and plastic products |

| | |
|---|---|
| Change required to sustain the material market | **To provide information on**<br>· Update application of new technology, according to the needs of the present<br>· Supply and demand sources<br>· Domestic and hazardous waste, concerning on recycling issue<br><br>**To develop mechanism on**<br>· Technology to easily connect between stakeholders<br>· Encourage those who have good measures to maintain the market<br>· Appropriate purchasing price<br>· Develop an appropriate mechanism to encourage and support enterprises to collect and recycle activities.<br>· Propagating and mobilizing people to separate waste at source; Developing policy to support units to classify recyclable waste.<br>· Manage the number of sources generated, collection and use<br>· Utilize sources of materials and scraps<br>· Need to ensure public competition<br>· Awareness of public and enterprises<br><br>**To advise on policy**<br>· Policies on collection and import of recycled materials should be clear for each plastic group<br>· Stable policy, do not change tax due to lack of money, do not add environmental requirements only to make difficulty to enterprises<br>· Guidelines and policies to classify waste from consumers.<br>· Need to have policies to support and develop the market.<br>· High taxes apply to this market, to limit release to the environment which consider the "landfill" of imported from other countries<br>· There must be strict management in terms of waste plastic treatment technology and corresponding production lines<br>· Policies to support enterprise to recycle and propagate people to classify waste at source<br>· Suitable policies for recycling enterprises. Measures to avoid environmental pollution<br>· Price policy and communication information, management policies: Simplify procedures and reporting systems<br>· Governmental policy<br>· Legal procedures for collection, treatment, recycling, import and export of scraps<br>· The legal corridor to stabilize price<br><br>**Other**<br>· Change in production scale of enterprises directly produce plastic and paper products<br>· No corruption, no relationship in family<br>· Having good production facilities, good machines with sewage systems ensuring standards of domestic wastewater and industrial wastewater, stable prices<br>· Investment on technology |

| | |
|---|---|
| Reason for being interested in market place (interested content) | **Paper**<br>· Paper scraps<br>· Paper scraps, paper products<br><br>**Plastic**<br>· Plastic<br>· Plastic<br>· Plastic scraps materials<br>· Materials for plastic industry<br>· Plastic bags and glass, plastic bottles<br>· Recyclable plastic, biodegradable plastic<br>· Waste, nylon and plastic packaging<br><br>**Market:**<br>· Plastic scraps market<br>· Market of paper scraps<br>· Scraps material market<br>· Supply sources of scraps and recycling plastic<br>· Quality of recycled plastic sources used for packaging<br>· Market of PP recycling plastic material<br>· Environmentally friendly materials, recycling technologies and applications made from recycled plastics<br>· Appropriate quality and price<br>· Demand of recycled paper scrap market, environmental protection in recycling activity<br>· Price<br>· Environmentally friendly products<br><br>**Policy:**<br>· Governmental policy on recycling scraps<br>· Policy of scrap import targeted right subjects<br>· Import of scraps<br>· Legislation<br>· Procedures for importing plastic scraps and licensing to eligibly import waste materials as production materials<br>· License for importing plastic scraps<br>· Preferential policies when using recycled materials<br>· Limit deforestation for paper production<br>· Governmental policy<br><br>**Technology**<br>· Technology and equipment for recycling plastic and paper products<br>· Waste treatment<br>· Environmentally friendly recycling method<br>· Using recycling materials for production<br>· Treatment of plastic wastes discharges into environment annually<br><br>**Other**<br>· Inputs of products<br>· Waste<br>· Environment protection<br>· Classification and treatment of toxic waste<br>· Join hand in an effort to build a clean, beautiful and green environment |
| Reason for not being interested in market place | Not provided |

***Table 17. Feedback on development of Vietnam material market***

The above feedback can be summarized for the development of the materials market as follows:

· **The objective of market place:** The materials market is not limited to connections between buyers and sellers but thanks to this, purchase costs should be lower, more transparent and the sector will be more competitive. Besides, it is also expected that the waste collection and recycle ratios in the country will be improved, i.e. less waste will be discharged to the environment. More than that, the materials market will structure the scrap purchasing system, promote waste reduction at source, support the development of legislation in waste transportation and even treatment of persistent plastic waste.

· **The governance:** The opinions of key leaders and participants varies and covers all possible stakeholders, including the government (MONRE, MOIT), NGOs (VCCI, Associations) and enterprises. Some said only public while other mentioned only private or a combination. However, scrap is under strict government management. Therefore, a material market should be presented with public-private partnership.

· **The activity:** A materials marketplace for Vietnam is not just a trading platform. The platform is expected to be a joint effort by stakeholders to provide information and impact on the choice of waste treatment technology, on policy and compliance of the participating stakeholders.

The respondents come from all over the country. Below is the list of ten provinces with the highest number of respondents of large and medium scale.

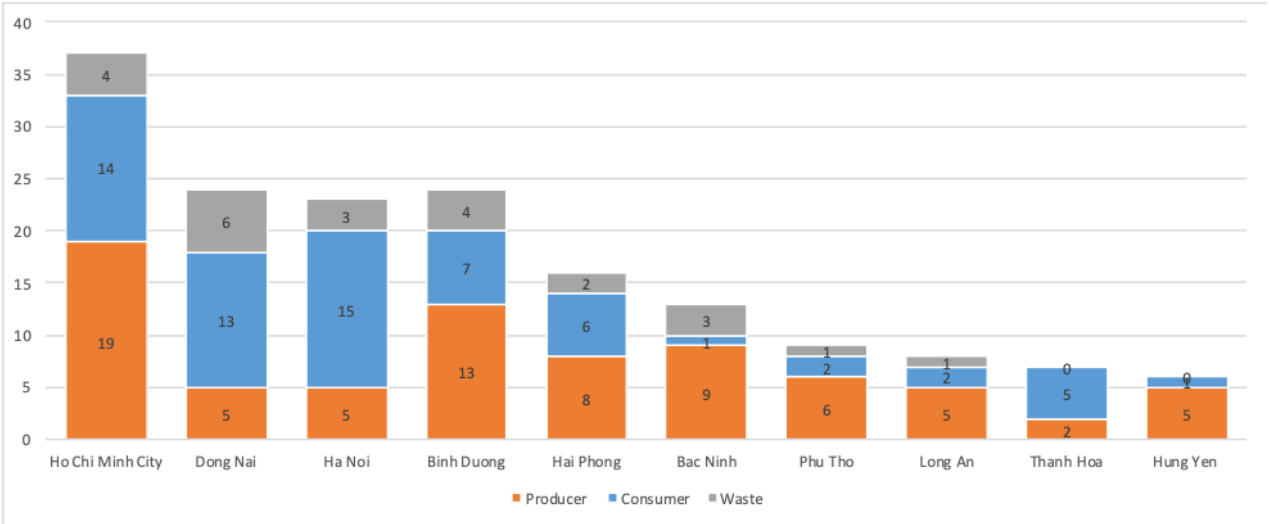



***Figure 16. Locations with large and medium scale respondents with interest in material market***

### 2.2.2. The activities, motivation and constraints under a circular economy

Recycling and reuse of waste material are more common amongst producers (44%) than consumers (24%). These ratios in the plastic sector (60% and 28%) were much higher than in paper sector (33% and 22%). Nevertheless, in both sectors,

consumers will be motivated by less expensive materials, legal requirements, and the image of being a green consumer and supply chain. However, this order changes between compliance and image. This means the impact of end user to consumer (intermediate user) is higher than that from intermediate user to producers. Requirements on using recycling materials in semi and final product is observed at 10% consumers and 7% of producers.

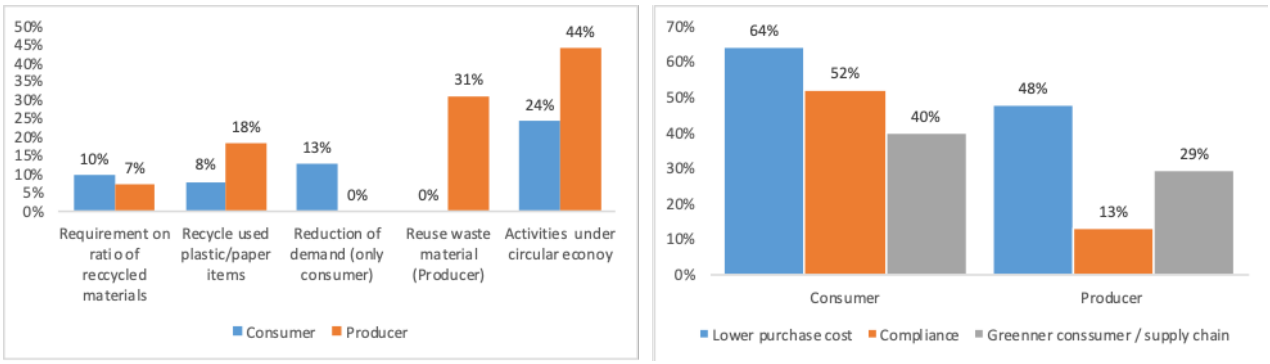



***Figure 17. Activity under circular economy and motivation***

Activities on the use of recycled material will help companies respond positively to the development of a material market. Cost savings, as well as compliance concerns will motivate stakeholders. The marketplace, therefore, **should share specific information about the possible content of recycled materials in a product**.

When being asked about the constraints for not to increase the ratio of recycling material, quality requirement is most concern (66%), then availability of scrap (45%).

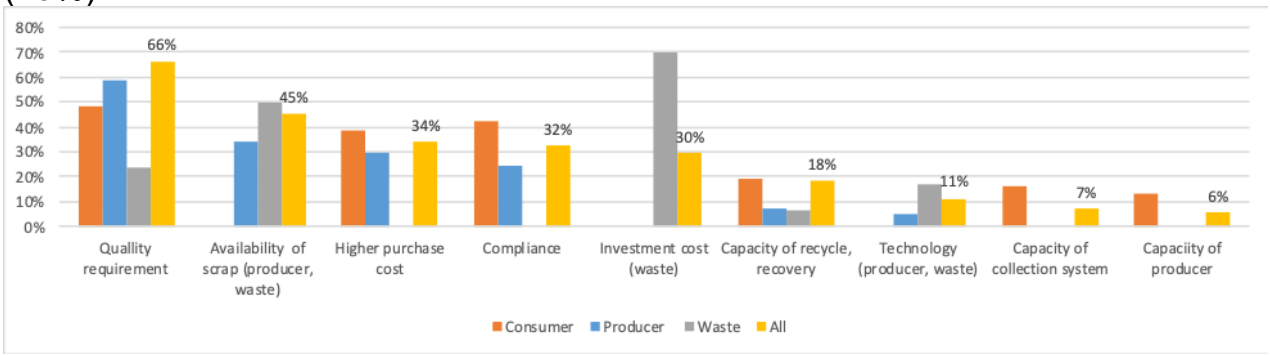



***Figure 18. Constraints for not increasing higher ratio of recycle materials***

The table below presents additional explanation on motivation and constraints in conducting activities under circular economy of respondents.

| | Consumer | Producer (Plastic) | Producer (Paper) |
|---|---|---|---|
| Activity taken | Packaging only<br>Recyclable FSC paper<br>Carton box<br>OCC type 98x2<br>PP<br>Some plastic items<br>Recycle<br>Returned by clients to reprocess<br>To reuse in lower quality requirement<br>Check reasonable and safe usage<br>Saving<br>Reuse plastic containers<br>Paper saving<br>To plan and benchmark<br>Improvement in packaging with consultation with clients<br>Reduced packaging size | Package for animal<br>Some export products require 100% recycled plastics<br>Producing technical resin<br>Non-contaminated and mis print materials<br>Defect product for recycle and recover<br>Only with defect product<br>In case it is recyclable<br>Some product<br>Plastic cap for bottle<br>If can be used<br>Only waste materials from company, not from outside<br>Both waste materials and product<br>To produce belt<br>To produce recycled resin<br>Some not meeting requirement<br>Client request<br>Per benchmark<br>Mix of recycled materials with original<br>Possible to recycle after sale<br>Collection for recycle<br>All waste materials are collected for reuse<br>Producing packaging paper for clients<br>For packaging purpose<br>Collecting waste materials from clients<br>Collect for materials of production<br>Recover materials from collected products<br>70% recycled materials<br>5-10% recycled materials<br>Very little | 100% recycled<br>Kraft paper<br>100% recycled paper<br>90% recycled materials<br>Import materials<br>Recycle to production under certain ratio<br>1% recycled paper<br>Waste paper<br>OCC<br>Client request<br>Per FSC standard<br>Cheaper<br>Producing recycled paper<br>Defect product to recycle back to production<br>Recycle paper product<br>To produce belt<br>To produce recycled resin |
| Activity not taken | No demand<br>Only original resin<br>Must be original resin for pharmacy<br>Not setting requirement<br>Being intermediate user<br>Quality requirement<br>Quality requirement<br>Client requirement<br>Must not use recycled items<br>100% original resin<br>Pharmacy packaging, no recycled ratio<br>Not setting requirement | Only by-product<br>Original resin only<br>No requirement from client on recycling material, but quality<br>Original resin from Korea<br>Not enough recycled materials available<br>Client request<br>Food sector (water), thus not possible to use recycled materials<br>Only original materials<br>Original PET<br>Original plastic only<br>Only collection for sold, not recycle<br>Product are mainly for export | 7% recycled materials<br>Only applied with defect product<br>Scrap paper is recycled for production<br>OCC recycled<br>Informing clients to rebuy waste materials<br>Purchase waste paper from packaging company<br>Material is recycled carton<br>Collecting waste paper<br>Recover materials from collected products |

| | | | |
|---|---|---|---|
| | No because it contains information for users<br>For recycling unit<br>recycling bottle, dispose label sold as scrap paper<br>Sold to recycled units<br>Defect items to return to manufacturers<br>Not able to reuse<br>Intermediate user, sold is sold<br>Recycle<br>Fiber dilution system<br>Waste separation for treatment<br>Sold to recycled units<br>sold as scrap<br>Client requirement<br>Paper label is required by law<br>Improvement in production to reduce paper demand<br>Intermediate user<br>Purchased by demand<br>Package is a requirement<br>Only recycled paper is used<br>Dependent on consumer | This might affect quality of products<br>All are consumed by clients, no recycle<br>Daily transfer to consumer<br>No equipment<br>Defect product is collected for sale, but not recycled by ourselves<br>Pre-process recycled products<br><br>Selling products from original resin<br>No demand<br>To sell as scrap<br>Under trial<br>No recycle to ensure quality<br>No recycling of used product | Import materials for production |
| Motivation for recycling | Company vision is sustainable development<br>Contribute to environmental protection<br>Per circular number 58/215/TTLT/BYT-BTNMT on medical waste | To produce environmentally friendly product<br>Reduce waste ratio to environment<br>Defect product can be recycled as materials<br>Up to a certain ratio of recycled plastic is possible and cheaper than original resin<br>Cheaper than original resin<br>Less production time<br>Higher competitiveness<br>Obtain license for business and import waste<br>Per requirement of waste treatment<br>Environmental protection<br>Environmentally friendly product, self-degradable<br>Per market demand and supply<br>Per client request<br>Per recycling demand of company | Policy of CORELEX - JAPAN<br>Carton box from packaging company<br>Savings of electricity, water, tree<br>Reduce waste ratio to environment<br>Lower benchmark<br>Recycled paper is 3 times cheaper than original pulp<br>Higher competitiveness<br>Ensure production environment<br>Per requirement of waste treatment<br>Waste to Kraft paper<br>Environmental protection, forest resources |

| | | | |
|---|---|---|---|
| Constraint for higher ratio of recycle materials | Might not meet quality requirement<br>Paper to meet quality standards<br>Food packaging must meet requirements on hygiene | Change in material, change in cost<br>High cost, slow supply<br>High cost for secondary treatment<br>Quality of product will be impacted<br>Pharmacy and food sector require no or very little recycle ratio of materials<br>Difficult for product quality management<br>Reduce quality of products<br>Recycle many times means lower quality<br>Always ensure product quality<br>Must meet quality requirement<br>Quality reduces when ratio of recycle increase<br>Limited wasted PP in country<br>Not enough resource for production<br>Reduce equipment lifetime<br>Wish to have lots of materials for production<br>Limited resources, limited collection for recycle<br>Need equipment and space<br>Always wish to have regular activity<br>Limited choice, thus limited products<br>Wish to renew waste material import license<br>Import of waste plastic is difficult by law<br>Difficult condition for importing waste materials<br>Shipping does not accept waste to transport<br>Client requirement | By client<br>Price of Kraft paper reduced while waste paper increased<br>High cost for secondary treatment<br>Quality of product reduces along with number of recycle<br>Not to high quality paper<br>Must meet quality requirement<br>Not enough resource for production<br>Most recycled paper is imported<br>Limited resources, limited collection for recycle<br>Lack of waste material sources<br>Limited choice, thus limited products<br>Difficult to import waste material<br>Difficult condition for importing waste plastic |

***Table 18. Motivation and constraints for taking activity under circular economy***

### 2.2.3. In-depth interviews

In-depth interviews were conducted with members and partners of VCCI between March 30 and April 23, 2019. In total, 14 face-to-face interviews were conducted, of which two were waste service providers, six were producers, one a product user, three industry organizations/NGO, and two, governmental authorities.

Following are the key findings and critical issues raised by stakeholders:

#### *2.2.3.1. The importance of recycled material in the production process*

All the stakeholders consulted recognized the importance of increasing the use of recyclable materials and the potential environmental problems posed by the production processes. They understand that production using virgin materials, including pulp and plastic resins, is expensive and likely to become mores. Meanwhile, the use of recycled materials aligns with the trend of the circular

economy. At the same time, it reduces production costs and has great potential to positively impact the environment.

> *The level of using recycled materials at our company is always at 95% maximum. We always try to re-use materials that can be reproduced, in order to minimize the pressure on the environment while saving costs. (In-depth interview, one manufacturer).*
>
> *It is worth mentioning that although the input materials are scrap, the finished products that we provide for the market are highly qualified and meet export standards. (In-depth interview, one manufacturer).*

#### *2.2.3.2. Drivers for importing used material*

A number of common reasons emerged when discussing the drivers for importing used materials:

- In Vietnam, **recycling material in the paper and plastic industry only partly meets industry's demand**. On the other hand, the classification of waste in Vietnam has not been implemented strictly, while waste collecting activities are small-scaled, spontaneous, and not well-organized like in other developed countries. Moreover, the businesses that specialize in these activities are limited in quantity and quality. Although domestic scrap collection has developed in recent years, it has not kept up with the demand for production materials, which lead to a strong import trend. In contrast, the supply of paper from the world is available and abundant.
- Secondly, **the quality of imported scrap is higher than the domestic scrap**. It is often inspected and, therefore, more likely to be of known quality prior to arriving at the facility.
- Thirdly, the industry-supporting recycling activities have not yet developed significantly in Vietnam. Most machines, devices and chemicals are self-made or imported from abroad with low quality and are difficult to control. Another difficulty for Vietnamese businesses operating in this industry is that there is no appropriate legal framework to support, especially in production monitoring, operational efficiency and product quality. Therefore, **to ensure consistent quality supply, the company often needs to import scrap material from outside.**
- Lastly, a costs issue. Vietnam does not have a tax policy to support and encourage the recovering and recycling activities. A difficult requirement to meet is that people who buy bottles and rubbish have to have a value-added tax (VAT) bill, so businesses that buy paper waste can deduct input tax. However, to have VAT bill for the scrap, which is collected from individual buyers is almost impossible. Therefore, the domestic supply has not met the documentation requirements for enterprises to enjoy preferential tax

deduction. On the other hand, developed countries have processes, incentives, laws and standards to encourage the collection, classification and reuse of recycled resources. **Therefore, the net price of imported scrap is very competitive and even better, in most cases, than domestic.**

#### *2.2.3.3. The most difficult hurdle to using less virgin-based materials*

The survey and interviews identified the current policies on importing scrap as the most difficult hurdle and future risk to using less virgin material. Stakeholders reported facing more challenges due to the tightening regulations on imported scrap at a time when most of the recycled materials that companies use are imported from other countries. This hurdle is most concerning for plastic scrap; Resolution No.09/2019/NQ-CP allows the import of scrap as raw materials for the production of plastic products only until December 31, 2024.

*Many businesses including those in packing, paper and plastics fields have been short of material for production and in danger of shutdown after the government tightened scrap import regulations which severely limited or delayed access to materials. About 5,000 containers worth US$10,000 each are stuck at ports. Businesses have to pay US$50-100 demurrage charges per day, suffer significant production interruption and are falling behind in scheduled goods delivery. These present significant hardships and put them in danger of losing business and even bankruptcy. (In-depth interview, one business association representative).*

*The company signed a supply contract for the year 2018. However, the company has been short of goods for delivery because of material shortage while domestic recycled plastics could not be used to make up the difference because of low quality. (In-depth interview, one manufacturer).*

#### *2.2.3.4. The biggest risk to running their business*

All stakeholders were concerned about their ability to find stable and high-quality sources of materials. They highlighted the impact of conflicting government policy on treating imported scrap as imported waste as one of their largest risks. Because the domestic waste market cannot meet production needs, they have no choice but to import. If Vietnam can promote the development of the collecting and recycling industries, companies will be willing to shift from imported to domestic sources. This would solve major production and environmental challenges they are facing. On the other hand, they would face major risks if the import of scrap/waste were banned without alternative solutions.

#### *2.2.3.5. The willingness and readiness to contribute to the development and operation of a Vietnam Materials Marketplace*

Most of the stakeholders interviewed expressed their willingness to participate in a materials marketplace as they could see a lot of benefits to joining the platform. They believe it will improve access to new customers, as well as opportunities to supply by-products from their processes as input materials for other industries. For example, solid waste contaminants (plastic, metal) from pulp and paper production could be managed either in-house or by a service provider for treatment and separation, to be used by others or for their own needs. The stakeholders interviewed expressed that a marketplace platform could create a positive and transparent business environment if it could include sufficient data on materials, products, price, quality and business performance of stakeholders involved.

> *The material marketplace is indeed a good idea. We will have more chances to find new destinations for materials. Right now if we need to find sources for material, we need access to the internet and find relevant information on foreign websites specializing in this type of material. Some foreign websites list waste prices in many markets, as well as the amount of imports and exports in a country for a year but not in Vietnam. (In-depth interview, one manufacturer).*

Even companies consulted that have a quality tracking system and well-managed internal production processes from beginning to end are interested in a service that offers ongoing insight to where their by-products are going.

> *In the future if there will be a service that provides comprehensive, accurate and timely information for a company to understand its product route at a reasonable cost, we will be willing to use this. In fact, for paper and plastic industry, waste must be recognized as a renewable resource, rather than garbage. (In-depth interview, one manufacturer).*

The main question raised by stakeholders is how the material marketplace will work. Who will be in charge of running it and what are the requirements for joining?

#### *2.2.3.6. The role of governmental policy*

A strong theme that comes out clearly from the interview process with stakeholders is the role of governmental policy and stakeholders' desires for how the policy should be changed.

Most of the companies interviewed believed that the policy framework for environmental protection has, in general, been well established and managed in Vietnam except in the case of scrap and recycling. The regulations that do affect the recycling industry, including paper and plastics, are mostly governed by the

MONRE and the Vietnam Environment Administration (VEA) under MONRE at the central level, and the Department(s) of Natural Resources and Environment (DONRE) at the city and provincial levels. The LEP has encouraged the recovery, processing and recycling of post-production waste. In addition, the Green Growth strategy in 2012 and Vietnam's Renewable energy development strategy to 2030 vision of 2050 also has the ambition for Vietnam to change community awareness on the issue of waste circulation. However, Vietnam still lacks specific regulations and guidelines for supporting implementation. The amount of waste generated is growing in Vietnam but the programs and infrastructure for collection and reuse are not keeping up. Vietnam has not yet developed standard classifications of waste from the variety of sources due to a lack of technology and resources. Therefore, the government could have a critical impact in promoting the development of the circular economic model and recycling industry. In addition to legal documents, the government should soon issue standards, regulations and guidelines related to recycling/reuse. This work should also create incentives for businesses to process and consume recycled products.

> *There will probably be changes in policy, especially when the economy is shifting towards a circular economic trend. (In-depth interview, one manufacturer).*

It was clear that those interviewed, especially those on the government side, worry that the country could turn into “an international dumping ground.” This fear is driving the approach to regulation.

> *Vietnam has a demand for scrap as material for production, but it only benefits the processors. (In-depth interview, one government officer).*

> *Vietnam has to start saying no to scrap import because the country is not able to deal properly with solid waste. (In-depth interview, one government officer).*

## 2.3. Case studies

### 2.3.1. Group 1: Product user, distributor, consumer

For sustainable development, Coca-Cola Vietnam Beverages Ltd. (Coca-Cola Vietnam) has developed requirement on greening products. The program "Zero Waste to Nature", which Coca-Cola participated in, aims to enhance sorting waste at the family level and improve the rate of plastic waste collection. In early 2018, Coca-Cola global set the following target for 2030:

- 100% of plastic bottles of Coca-Cola will be collected at global level
- Increase the ratio of recycled PET (rPET) to 50% to mix with primary PET resin to produce bottles (the current rate is 100%).

For the Vietnamese market, the following activities will be implemented to achieve the targets:

**Design:** In 2019, the goal is to create bottles containing at least 10% of rPET. The ratio is intended to be increased up to 20%, 30% in the coming years. However, Coca-Cola Vietnam has faced a number of difficulties in achieving the set targets:

- There is no enterprise that can produce rPET in Vietnam. Therefore, rPET must be imported. Hence, the cost of bottles production containing rPET will be higher;
- No company in Vietnam can produce recycled plastic granules that satisfy the standard for food containers;
- Currently, the mix of rPET with virgin PET resin to produce bottles is in testing phase to check the conformity with national TCVN requirements.
- Other factors that need to be considered in using rPET in final products include the quality of rPET granules, the capacity of the selected recycling units, and the market demand of rPET and price.

**Collection:** PCRI, Packaging Recovery Initiative, targets an increase in both awareness and collection rate; while encouraging development of recycling technology. According to Coca-Cola Vietnam, difficulties in collecting and recycling plastic products include: (i) lack of awareness about the importance of waste sorting, (ii) lack of infrastructure for collection, recycling and processing and (iii) significant investment cost for collection and recycling technology.

**Partnership:** The important thing for partnership is a commitment. Coca-Cola alone cannot solve this problem. The role of the VPA is to create the connection among enterprises in the industry, provide common voice to protect the interest of its members. Coca-Cola Vietnam is working with with relevant agencies such as VCCI,

VBSD, NGO_GreenHub, UNESCO in Ha Long, Hue, Da Nang, HCM on activities related to waste collections.

As recognized by Coca-Cola Vietnam, establishment of marketplace for recycled materials aims to connect sellers and buyers. Since Coca-Cola Vietnam requires relatively specific plastic products, which meet requirement on Food-Grade quality, the company will ready for qualified domestic supplier for rPET only. Material marketplace will play a significant role to create motivation for the current collection system of scraps in Vietnam.

To promote circular economy in Vietnam, Coca-Cola Vietnam will be willing to work with other companies, VCCI and concerned agencies.

### 2.3.2. Group 2: Producer

As common practice, for processing of primary plastic, wastes are mainly the packaging, container of imported materials for production; those wastes are collected and are sold to collection/recycling units. For paper recycling, as reported by Phu Giang Paper and Packaging Company, solid waste in average is 1-2%, maximum 5% and those wastes will be segregated the second times to collect recyclable material, such as metal, plastic then sell them to recycling units. The company signed contract with processing units such as Thuan Thanh Bac Ninh Environment Company to collect and handle wastes which cannot be recycled like oil and grease, gloves, which is only about 50% of 1-2% removed. Treatment cost is about VND 10-20 million/month (production capacity is more than 50,000 tons/year, about 5,000 tons/month).

At Lee & Man Vietnam, solid waste contaminants (plastic, metal) discharged during the sorting of paper scraps are evaluated for reuse/recycle. Non-reusable waste is processed at the factory with the ash being purchased by a cement company to produce cement or other companies to produce unburnt bricks.

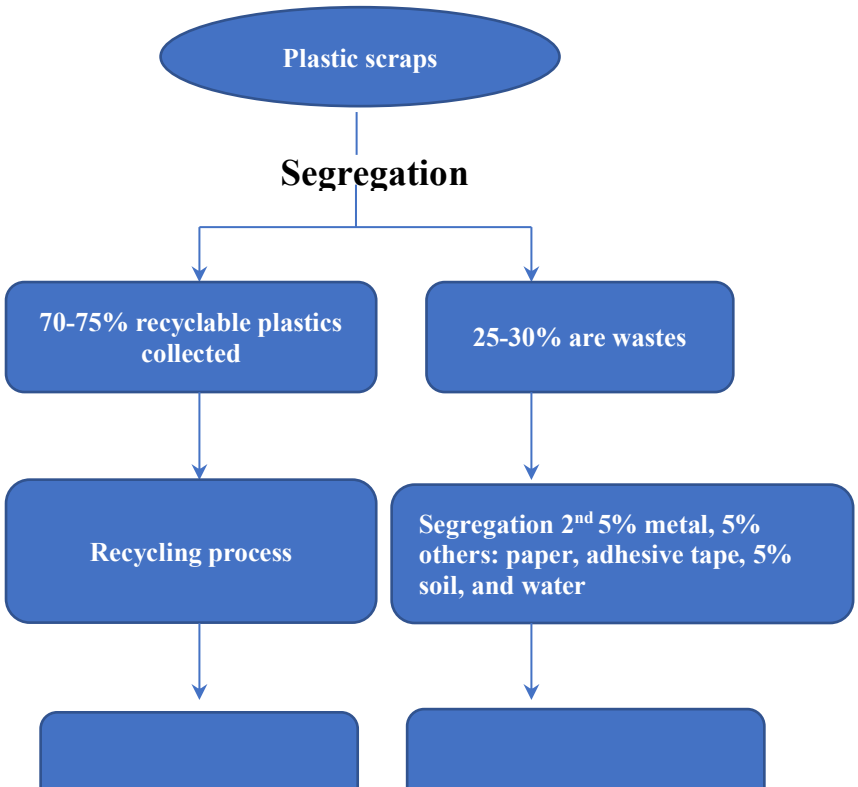


***Figure 19. Flow of plastic scraps in craft village***

We observed two models of imported plastic scraps handling during the on-site work. The first involves a medium-to-large company located in an industrial zone; input materials are several thousand tons/month. In this case, we visited Vinatic JSC. The second model involves a small operation at the craft village level. In Vinatic JSC, 98-99% purchased scraps are recyclable; impurity is only 1-2%, which include labels, metal and paper. The company sets up a team to inspect the imports and photos will be taken before putting scraps into containers for delivery. At the craft village level, an average of only 70-75% of imported plastic scraps can be recycled to produce plastic granules, the remaining 25-30% is wastes, which will be classified for the second time. Metal accounts for about 5% of contaminants. The rest are other components such as paper, adhesive tape, labels, etc.; only about 5% is soil and/or water. After the second classification, the non-recyclable materials, which are about 12-15%, will be treated at landfill sites.

The first one is “legal” recycling, implemented by licensed enterprises (by MONRE for importing and recycling plastic scraps); those enterprises are usually located in industrial zones with modern equipment with advanced technology and operation standards. The second one is smaller business entity, without MONRE’s license, normally located at craft villages. Although both use imported material for production, the significant differences between the two models are the investment cost, production capacity, economic and environmental benefits. The table below compares the costs and benefits of the two recycling models.

| | **Legal recycling enterprises** | **Craft villages** |
|---|---|---|
| Efficiency of imported scraps as input materials | 98-99% are recyclable;<br>impurity is only 1-2% | only 70-75% can be recycled |
| Capacity | = (4,000 tons/month * 100%)/98% = 4,081 tons/month | Capacity = 20 tons/month<br>After segregation, produce 15.5-16 tons of recycled plastic (output) |
| Investment cost | - | VND 2 billion<br>USD 100,000 |

| | | |
|---|---|---|
| Recycling activity | Dry production of granulation technology with magnetic heating system, only pure PE plastic smell, without smoke. Washing steps are not applied, so water is only used to cool down the plastic granules. | Wet technology, normal heating: Sorting - cutting, grinding and washing - drying - melting and extruding - granulating |
| Price of input materials | VND 6,000-7,000/kg for domestic scraps<br>VND 12,000-14,000/kg for imported scraps | VND 12,000/kg for imported scraps |
| Operating cost: electricity, workers, transportation, etc. | 10% | Classification cost (for 20 tons): VND 12,000,000/20 tons<br>Worker (for 15,5 tons): VND 900/kg<br>Electricity (for 15,5 tons): VND 600/kg<br>Transportation fee (from export port to factory): VND 13,000,000/container 20 tons<br>In total: 14.6% |
| Output products | VND 20,000 - 25,000/kg<br>Capacity: 4,000 tons/month | VND 21,500/kg<br>VND 330,000,000/15.5 tons/month |
| Benefit | = (VND 20,000/kg * 4,000,000) - 10% management cost - cost of input material (3,200 ton * 12 mil/ton + 800 ton * 6 mil/ton)<br>= VND 28.8 bil/month<br>= US$ 1.25 mil/month<br>= US$ 306/ton | = 330 mil - 240 mil - 12 mil - 13 mil - (900+600)*15,500<br>= VND 45 mil/month<br>= US$ 2,000/month<br>= US$ 100/ton |

***Table 19 Comparison of two plastic recycling models***

Vietnam only meets 20% of the demand for plastic materials, so the remaining 80% must be imported. Of this 80% of imported materials, virgin and recycled resin make up the majority while plastic scraps occupy only a small portion. Domestic plastic scraps sources are also collected such as plastic bottles, buckets, plastic pots ... but the volume is very small and highly contaminated in comparison with imported plastic scrap. Currently, plastic recycling enterprises are eager to use more recycled materials/scraps, due to their low cost and high domestic demand. The price of domestic scraps is about USD 2.6-3.0/kg, while the price of imported scraps is nearly double. Primary plastic granules cost about VND 30,000/kg, while recycled plastic granules (high quality) are about VND 22,000/kg. The difference is about USD 350/ton.

Companies interviewed raised concerns about strict regulation on importation of scraps and the resulting lack of input materials for production. Moreover, other factors also affected to the importation of scraps such as supply and demand factor, Chinese small traders are still smuggling scraps, which affects the price of scraps.

There is risk related policies which are changed too fast without any roadmap, which strongly affects access to the input materials. This regulation, mentioned in the Resolution 09/2019, only allow intermediate production, such as producing plastic pellets from scrap, until 2024. Therefore, the company must invest in more

equipment to produce final products (such as packaging material), which may cause high competition in the market, due to number of companies producing final product.

### 2.3.3. Group 3: Waste Service Provider

With URENCO Hanoi, one of the primary waste collectors and landfill operators, recycling activities are very limited due to the fact that most recyclable materials such as metal, plastic, paper, etc. were already collected manually by scavengers which are then sold to recycling companies. In several sub-companies such as URENCO10, URENCO 11, URENCO13, recycling activity is only segregation of recyclable materials as scraps.

In 2007, there was a pilot 3R project in 4 wards of 4 districts in Hanoi, in which organic wastes were classified to produce compost in Cau Dien Waste Treatment Company (URENCO7). Although the quality of produced compost is good enough, economic efficiency is not good as expected due to high operation cost, leading to high price and low competition with similar products.

A branch of URENCO Hanoi has piloted a service team to segregate recyclable materials and buy those materials from scavengers at the same price in the market. However, the modality is not feasible, due to following reasons:

- The purchasing group is not specialized, purchasing prices was not identified properly, therefore, those type of collection is not effective;
- Facilities and vehicles were not invested;
- Requirement of big workshop area for storage;

Regarding treatment cost, treatment price by landfilling of domestic waste from households, production facility is Vietnam dong 500,000/ton, including transportation fee. The price for 1 m3 of domestic waste is VND 208,000/ton. The treatment price of industry waste by incineration is from VND 800,000-2,500,000/ton, depending on composition of waste, distance and treatment technology. The treatment price of hazardous wastes is the highest, from VND 2,000,000-15,000,000/ton, depending on code of waste and applicable technology as regulated by Circular 26/2015 on hazardous waste management of MONRE.

Treatment price by incineration is VND 400,000/ton for domestic waste and VBD 500,000/ton for industrial waste, excluding transportation fee.

Amount of waste collected is 300 ton per day, amount of collected for recycling is 30%, the ratio is expected to be 50% in Quarter 3 of 2019. Within amount of 50% recyclable materials collected, plastic and nylon bag are 35%, metal is 10%, paper

and glass are 5%. The 50% remain includes 25-30% are brick, stone, soil and 15% is organic wastes, which are pilot to produce compost.

Plastic scraps are collected and recycled within the company (PE, PP, PET, PVC, excluded LDPE and HDPE). Recycled products are plastic pellets (for trading in domestic market) and straps (for internal use). Paper scraps are collected then are sold to recycling units.

### 2.3.4. Group 4: Other stakeholders

In both VPPA (Vietnam Paper and Pulp Association) and VPA (Vietnam Plastics Association), data collected reflects that the total amount of domestic scraps collected is not significant; in 2018, domestic paper scraps collected was 640,000 tons and plastic was 700,000 tons. This is not a systematic collection process; it is done by individual scavengers and junk shops at three levels:

- 1st level: scavengers and waste pickers who directly collect recyclable materials at households, waste gathering points and even in landfills;
- 2nd level: junk shops which purchase recyclable materials from scavengers and waste pickers. Greenhub in Hanoi has found that many Vietnam provinces have small-scale junkshop networks in each ward and district;
- 3rd level: big scraps dealers which purchase recyclable materials from the junk shop networks in large scale. In an example provided by Greenhub and Viet Trung Environmental Technology Co., Ltd, almost the entire amount of plastic scraps in one set of junk shops is routinely transferred to dealers in Hung Yen, where two plastic scraps recycling craft villages are located.

Since the collected domestic supply of recyclable material is not sufficient, both the paper and plastic industries have to import input materials for production. In 2018, the plastic manufacturing industry in Vietnam imported more than 5 million tons of plastic materials from the Middle East, Korean, Taiwan and the USA. Most was virgin, primary plastic with plastic scraps being less than 10%. Domestic source collected accounted for only around 40% of the paper industry's demand. The rest - about 3 million tons per year - had to be imported.

In 2018, policy on requirement of imported scraps have strongly affected to enterprises of VPA and VPPA, due to complicated procedure in customs clearance, many partners to be assigned to be involved in inspection of scraps at custom port, including local DONRE (of enterprise which imported scraps), MONRE, custom and independent appraisal agency. In March 2019, the regulation has been modified, in which, local DONREs are removed from the verifying, only independent inspection units and customs are involved. As requested by VPPA, paper scraps should be considered input materials/goods rather than scraps since import procedures of

scraps face with difficulties in inspection and testing. Then, environmental management must be strict at recycling facilities in terms of satisfying requirements on wastewater, solid waste and gas emission. Both VPA and VPPA have expressed their concerns on development of policy to promote collection and recycling domestic scraps.

In 2018, total production capacity of the Vietnam paper industry was 3.6 million tons, mostly for domestic consumption, with only 640,000 tons exported to China. According to VPA, in 2018 the plastic industry's total production was 8.3 million tons, of which total plastic material (plastic pellets) exported is 897,000 tons. The remaining 7.4 million tons was plastic products exports and domestic consumption.

Both the Division of Environmental Industry, Industrial Safety Techniques and Environment Agency (MOIT) and Department of Waste Management, Vietnam Environment Administration (MONRE) reported that they struggle to develop and manage the recycled materials markets for plastic and paper in Vietnam. There are only 20 enterprises with a proper license to import plastic scraps in Vietnam, however, many other enterprises still smuggle "scraps", many associated with the craft villages. It is common for the containers they import to contain less than 75% of recyclable material. Therefore, governmental agencies place top priority on strictly managing these scrap imports. A structured and comprehensive materials marketplace, in their point of view, will need to include imported materials as well as capture and promote domestically sourced materials since the domestic supply of materials is always less than the demand. It is important, then, that the marketplace be a transparent and reliable source of information on the flow and transfer of scrap imports as well as a tool to promote the collection and availability of domestic materials and transactions.

On the industry association side, VPA considers a materials marketplace platform to be essential due to (i) insufficient domestic supply for input materials, (ii) the demand in big corporations to add recycling materials into final production with ratio from 30-50%, (iii) the fact that primary plastic is based on available oil resources which are limited, (iv) the price of recycling plastic being lower than primary/virgin. Also, as regulated in the Resolution 09/2019/CT-TTg, imported scraps are no longer allowed for production of intermediate products (such as plastic pellets), only for production of final products. In fact, in response to the regulation, some enterprises have prepared a roadmap and are seeking investment to change their business from production of intermediate product to production of final products. Therefore, the materials marketplace platform will play a significant role in balancing the supply and demand of input materials, bringing these two ends of the market together, a promoting the classification and collection of domestic scraps. A robust materials marketplace would enable these connections by providing explicit information on material origin, price and other specifications, which are currently difficult to obtain.

## 2.4. Identification of future challenges and recommendations

### 2.4.1. SWOT analysis

In order to better understand the present status of the recycling sector and the potential for the introduction of a marketplace for recycled materials and waste-to-resource approaches, it is useful to map out strengths (S), weaknesses (W), opportunities (O) and threats (T). In this connection, the SWOT analysis below attempts to synthesize the main features of the sector:

| | |
|---|---|
| **Strengths**<br>- Vietnam has favorable natural and political conditions to develop market place for recycling material.<br>- Existence of a small recycling rate based on informal networks of informal workers and the existence of a number of small and medium-sized companies working with recyclables along the recyclables value chain.<br>- High growth rate of paper and plastic industry.<br>- Abundant and cheap human resource is also an advantage to the development of the industry.<br>- High willingness of stakeholders to participate in marketplace. | **Opportunities**<br>- The potential for leveraging informal waste sector members as a vehicle to support the adoption of waste segregation practices and in order to expand waste collection coverage.<br>- Some waste segregation practices (albeit limited) already exist, which could be leveraged and up-scaled, both formally and informally.<br>- Demand for recycled products including paper and plastic remains high as Vietnam economy is developing and population is rising.<br>- Production capacity of recycled based materials (paper and plastic) remains low, technology is backward, domestic production has not met consumption demand, especially for those products of highest demand. Domestic production of plastic and paper now only meets partly of the demand.<br>- Paper and plastic industry is still highly attractive for investment. The increasing number of foreign investors in the industry shows the interest level of foreign investors in the industry. |
| **Weaknesses**<br>- Lack of a strategy, vision and goals for recycling sector, including targets for the conversion of waste into resources.<br>- Scrap collection system and rate in Vietnam are low developed.<br>- Paper and plastic production technology is still backward, leading to inefficient production and environmental pollution.<br>- Paper and plastic enterprises are not active in establishing their own domestic collection system.<br>- Paper and plastic industry is tightly regulated by the Government.<br>- Most recycling enterprises are still dependent on external sources for input materials. The proportion of imported input is still very high, which has negative impacts on production | **Threats**<br>- Unclear policy direction on recycling industry development, scrap management and waste collection and separation.<br>- Lack of a policy and regulatory framework supportive of waste-to-resource approaches.<br>- Limited awareness of stakeholders at all levels on circular economy and recycling and 3R principles.<br>- Limited experience existent in the country in implementing waste-to-resource approaches.<br>- Vietnamese enterprises have to face with increasing competition from imported products, especially for high quality paper and plastic segment which Vietnamese producers have not been capable of production; and for product segment, where demand has been nearly saturated. |

| | |
|---|---|
| stability as well as production cost. | - Household and craft village enterprises in recycling industry have to face with many difficulties and challenges upon shifting from traditional production method to new one and compliance with environmental regulations. |

### 2.4.2. Recommendations

Establishment of a materials marketplace and putting it to work is the right approach to managing the current environmental pollution in Vietnam from one side and promoting the circular economy from other side. To do this, the following strategic actions should be taken.

***Implement programs and tools for gathering data on material flows across entire supply chain.***

In order to develop, prioritize and measure progress towards a circular economy transition, Vietnam will need to improve access to data. Currently there is little information available on the flow of imported materials once they leave the port. Also, any data that does exist shows large discrepancies that may highlight existence of major undocumented and illegal flows. The pollution and economic growth risks are time-sensitive and there is danger in implementation of conflicting or ineffective policies and programs if actionable data does not exist on either the front or back end of these programs. This would waste valuable time and resources and would put progress at substantial risk. Vietnam government should partner with industry to implement programs and tools, such as the Materials Marketplace platform, tailored and localized for the needs of the Vietnamese stakeholders, that will drive the collection, normalization and transparent reporting of the flow of materials driven by both import and domestic sources. This will also provide a source of data for innovation and investment as well as policy enforcement and incentive management. These programs and tools would then provide stepping stones to a transactional system that connects producers/consumers of reusable materials and drive scale into a domestic circular economy.

***Development and completion of policies on waste management with focus on scrap and recycling***

Vietnam needs to continue to complete the legislation system on waste management with a focus on scrap and recycling. Specifically, there are some actions need to be taken: (I) Review and revise Decree 38 on management of waste and scraps; (ii) Clarify the definitions of scrap versus waste; (iii) Design appropriate policies, guidelines and incentives to develop the recycling industry and promote the segregation of waste at the source and (iv) Develop and issue a Recycling Law,

considering domestic waste materials as natural resources with the goal of minimizing the amount of waste materials to be treated by burying according to the National Strategy and Action Plan on Green Growth.

***Promote active and efficient implementation of existing policies and master plans on waste management with a focus on waste-to-resource approach***

Vietnam needs to push forward the successful implementation of: (i) National Strategy on Cleaner Production in Industry for minimization of solid wastes in production; (ii) Controlling strictly scrap import to avoid illegal waste import as required by LEP 2014; (iii) Formalization of recycling activities through the development of recycling industry as directed by the National Strategy and Action Plan on Green Growth; (iv) Improvement of waste management infrastructure through an effective implementation of promulgated solid waste management master plans.

***Invest in programs to increase the awareness and innovation in the circular economy and recycling industry to change behavior and attitude of both policy-makers and consumers***

This study highlights the challenge and opportunity that exists for companies that will seek to maintain both a high rate of profit and a commitment to meeting the environmental demands of the region. Basic changes in the strategy of a company are revealed through the environment concern of the company's shareholders and the belief that a "Green" company is a compulsory condition for cutting down the cost and a key to market share increase. Many enterprises now regard environment management and recycling as a strategic tool for enhancing competitive advantage. However, given the fact that the current public understanding about circular economy and recycling is still low, entrepreneurs also see little benefits/motivations in going green. Programs enabling companies to try these concepts and then rewarding and incentivizing them to adopt circular economy practices should be developed, tested and executed. Establish an innovation center or innovation zones using material data gathered from the identified by-product streams and fueled by internal/external investment. It would provide an opportunity for regulation flexibility and technology proof of concept and provide valuable material for outreach and education.

***Formalize role of business associations in a Circular Economy committee focused on policy, enforcement, incentives, data transparency and education.***

Industry needs stronger involvement in designing and executing policy and regulations in Vietnam including the scrap management policy. The regulation on

tightening import regulations on scrap has had a big impact on the paper and plastic manufacturing industry and other related industries. Business associations such as VCCI, VPA, VPPA etc. can and should play a key role in business sector development and act as an important bridge between the government and the business community. A Circular Economy oversight committee should be established, made up of industry, government (state & district), NGOs and led by VCCI. This group would be chartered with striking the most effective balance between pollution control, economic development and social justice. This group would maintain a constant dialogue with government on policies affecting the business sector, such as economic, trade, financial, environmental, social and legal policies. Without a clear and efficient mechanism for hearing them and programs that drive executable change, the involvement of the business community is likely to remain inadequate.

***Near-Term Recommendations***

To realize the above recommendations, Vietnam should have a concrete and transparent roadmap with sufficient details and reasonable schedule for creating and implementing a materials marketplace. To do so, consideration should be given to: (i) Economic, social and environmental achievement which is front-loaded as much as possible for the benefit stakeholders; (ii) installation of required pre-conditions for effective implementation; and (iii) pre-announcement of a clear long-term roadmap to related stakeholders in order to minimize transition and adjustment costs. To get started, below are priority near-term recommendations:

1. ***Present details of regulatory and manufacturing disconnections and opportunities to the VCCI/VBCSD Circular Economy Advisory Committee and work through solutions to protect the environment while allowing viable materials needed by manufacturing into Vietnam.***
2. ***Use a localized Materials Marketplace platform implementation as a central data collection and tracking system for government and business sectors.***
3. ***Establish an innovation center or innovation zones using material data gathered from the identified by-product streams and fueled by internal/external investment. It would provide an opportunity for regulation flexibility and technology proof of concept and provide valuable material for outreach and education.***
4. ***Establish better tracking and verification systems to allow for smooth flow of materials through Vietnam's ports.***
5. ***Use the VCCI/VBCSD November 2019 Sustainability Summit to bring these commitments together for implementation.***


***Figure 20. Opportunity and Challenge***

# 3. References

## 3.1. Annex 1. List of persons participated in the interviews & surveys

### 3.1.1. Interview

| No | Day | Location | Time | Stakeholder | Address | Note | Interviewer | Content | Contact | Email |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30.03.19 | Hanoi | 9.00-11.00 | Vinacolour Co., Ltd | Office: Room 510-ĐN2, My Dinh II Zone, Cau Giay District Factory: Lot CN7, Thach That Industrial Zone, Quoc Oai, Thach That District | Produce and recycle plastic | Linh | 1,2,3 | Mr. Nguyen Manh Cuong, Director | cuong.nm@vinacolour.com.vn |

| No | Day | Location | Time | Stakeholder | Address | Note | Interviewer | Content | Contact | Email |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 04.04.19 | Bac Ninh | 08.30-10.00 | Phu Giang Paper and Packaging Company | Tam Tao, Phu Lam Commune, Tien Du District | Recycle paper | Linh, Thanh | 1,2,3 | Mr. Hoang Trong Phuong, Production Manager | HP: 0989 612 960 Email: trongphuongvkpc@gmail.com |
| 3 | | Hai Phong | 14.00 - 15.30 | Vinatic JSC | Lot CN4, Nam Cau Kien Industrial Zone, Kien Bai Commune, Thuy Nguyen District | Import plastic scraps, recycle plastic | Linh, Thanh | 1,2,3 | Mr. Huynh Van Nhut, Logistic Director | Nhut.huynh-van@vinatic.com.vn |
| 4 | 09.04.19 | | 10.00-11.30 | Cocacola Vietnam | No. 485, Hanoi Highway, Linh Trung Ward, Thu Duc District | Beverage, Large consumer | Linh, Loan | 1,2,3 | Ms. Vu Thanh Truc: 0918872279 | vu@cocacola.com |
| 5 | 17.04.19 | Hanoi | 8.30-10.00 | Vietnam Pulp and Paper Association | No. 58, Vu Trong Phung, Thanh Xuan Trung Ward, Thanh Xuan District | Association, not sure about their role and view on market | Linh, Thanh, Bob | 1,5 | 024 6654 2872 Ms. Dang Van Son Secretary General Mr. Le Huy Du 0942050470 | 024 6654 2872 |
| 6 | | | 10.30-12.00 | Hanoi Urban Environment Company (URENCO) | 282 Kim Ma, Ba Dinh, Hanoi | Public waste treatment facility | Linh, Thanh, Bob | 1,2,3 | Mr. Dao Duc Khanh 0904735642 | Daoduckhanh76@gmail.com |
| 7 | | | 13.30-15.00 | Industrial Safety Techniques and Environment Agency - Division of Environmental Industry | 25 Ngo Quyen, Hanoi | Industrial waste | Linh, Thanh, Bob, Andy, Trung | 1,4,5 | Mr. Nguyen Sinh Thanh 0982085757 | |
| 8 | | | 15.30 - 17.00 | Lee & Man Việt Nam | BIDV building, 35 Hang Voi, Hanoi | Paper producer (member of VCCI) | Linh, Thanh, Bob, Andy, Trung | 1,2,3 | Ms. Doan Minh Ngọc 0969966188 | Doanminhngoc1210@gmail.com |
| 9 | 18.04.19 | Hung Yen | 8.30-10.00 | VietTrung Environmental Technology Co., Ltd | Minh Khai, Nhu Quynh, Van Lam, Hung Yen | Recycle plastic | Linh, Thanh, Bob, Andy, Trung | 1,2,3 | Mr. Nguyen Viet Tung, Director 0912340285 | moitruongviettrungetc@gmail.com |
| 10 | | | 10.30-12.00 | JP CORELEX (VIETNAM) CO.,LTD. | Road B1, Section B, Pho Noi A Industrial Park, Lac Hong Commune, Van Lam District | Recycle paper | Linh, Thanh, Bob, Andy, Trung | 1,2,3 | Mr. Do Van Son 0979068188 | |
| 11 | | Bac Ninh | 14.30 - 16.00 | HUNG PHAT URBAN ENVIRONMENT CO., LTD | Dong Sai Village, Phu Lang Commune, Que Vo District, Bac Ninh Province | Waste treatment facility | Linh, Thanh, Bob, Andy, Trung | 1,2,3 | Mr. Nguyen Van Tuyen Deputy Director 0986892486 | moitruongdothi@hungphat.org.vn |

| No | Day | Location | Time | Stakeholder | Address | Note | Interviewer | Content | Contact | Email |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 19.04.19 | Hanoi | 08.30-10.00 | Tổng cục Môi trường-Vụ Quản lý chất thải | Room B411, no.10, Ton That Thuyet | Waste management (policy and initiatives) | Thanh, Bob, Andy, Trung | 1,4 | 024 37956868 (ext: 3286/3287) Mr. Nguyen Thanh Lam | |
| 13 | | | 10.30-12.00 | GreenHub | Room 1008, Planning and Investment Ministry Building, Alley 7 Ton That Thuyet | | Linh, Thanh, Bob, Andy, Trung | 3, 4 | Ms. Nguyen Thu Trang, Deputy Director: 0988366070 | |
| 14 | 23.04.19 | Hanoi | 15.00-17.30 | Vietnam Plastic Association | 156 Nam Kỳ Khởi Nghĩa, Quận 1, Thành phố Hồ Chí Minh | Association, very active in waste market | Linh, Thanh | 1,5 | Ms. Huynh Thi My 0908249864/028 3521 8552 | hongmyvpa68@gmail.com |

***Table 20. List of persons met***

### 3.1.2. Survey

| No | Company | Activity |
|---|---|---|
| 1 | Hospital 71 Thanh Hoa | Treatment and health care |
| 2 | 74 Central Hospital | Medical |
| 3 | Miza JSC | Paper production |
| 4 | Song Tinh Co., Ltd | Waste purchasing and transporting, Aluminium recycling |
| 5 | HANOI PRINT SCIENTECH ., JSC | Printing and relating services |
| 6 | Da Nang Urban Environment Company | Public sanitary, waste collection, transportation and treatment |
| 7 | Alim Hanoi JSC. | Garment |
| 8 | Di Dai Hung JSC | Production of plastic household and packaging |
| 9 | Huong Quynh Cam Hung Co., Ltd | Production of plastic product |
| 10 | Tran Phu Printing JSC. | Printing industry production, paper bags production; import, export and trade of printing materials and equipment; services related to printing; warehousing and storage of goods |
| 11 | Minh Thong Production, Trading and Service Co., Ltd | Production and sale of PET plastic billet, bottle and cap |
| 12 | TRUONG BAO SON TRADING AND SERVICE Co.,JSC | Fast delivery shipping |
| 13 | Jasan Vietnam Co., Ltd | Production and export of high quality socks |
| 14 | PUNGKOOK Ben Tre Co., Ltd | Processing fashionable bags and backpacks |

| No | Company | Activity |
|---|---|---|
| 15 | Hong Hai Dang Plastic Production and Trading Co., Ltd | Producing and trading plastic packaging for pharmaceutical and food industry |
| 16 | Tuan Thinh Packaging Trading Co., Ltd | Trading services |
| 17 | Phong Dai Paper Co., Ltd - Taiwan | Carton box production |
| 18 | Thuan Duc JSC. | Production of plastic products (PP packaging, shopping bags) |
| 19 | Yamoto Industries Vietnam Co., Ltd | Production of motorcycle, brake and throttle wires |
| 20 | Tin Nghia Vietnam Printing Co., Ltd | Printing |
| 21 | Globe Exchange Co., Ltd | Trading plastic materials and chemicals for plastic industry |
| 22 | Industrial Safety Techniques and Environment Agency - MOIT | State management of industrial safety and industrial techniques |
| 23 | Tam Diep Urban Environment Company | Collection, transportation and treatment of domestic waste |
| 24 | Thien Tan Paper Co., Ltd | Collection and entrusted import recycling paper |
| 25 | NIPPO MECHATRONICS Co., Ltd (Vietnam) | Production of electronic components |
| 26 | DHG Phamarceutical JSC. | Producing and trading in pharmaceutical products |
| 27 | Thanh Tien Production, Trading and Service Co., Ltd | garment |
| 28 | PHARMACEUTICAL AND MEDICINAL PUBLIC COMPANY | Producing and trading in pharmaceutical products |
| 29 | Binh Minh Plastic JSC. | Production of plastic pipes and accessories: PVC-U, PE, PP-R |
| 30 | Yongfeng Vietnam Packaging Co., Ltd | Producing and processing knitted mesh plastic bags |
| 31 | JP Corelex (Vietnam) Co., Ltd | Production of high quality tissue |
| 32 | Thuan An Production Co., Ltd | Production of paper, paper packagings |
| 33 | HEINEKEN VIETNAM BREWERY - VUNG TAU JSC | Beer production |
| 34 | Hanoi Plastic Bag Production JSC | Production of exported plastic packaging and bag |
| 35 | Hoanh Chuong Co., Ltd | Commercial production, processing of plastic products (PVC, PE, PP, PS, ABS, PET) |
| 36 | Tan Thanh Plastic Co., Ltd | Production of và kinh doanh bao PP<br>Production and sales of PP packagings |
| 37 | Hanoi-Thanh Hoa Beer Co., Ltd | Production and sales of beer bottles, cans, box, pet products. |
| 38 | Tan Hong Phat Packaging and Transport Service Co., Ltd | |
| 39 | 30-4 Hospital | Medical examination and treatment for public security officers and soldiers according to regulations |
| 40 | Phu Thinh Printing and Trading Service Co., Ltd | Printing and relating services |
| 41 | SML Vietnam Co., Ltd | Production of printing label |
| 42 | Bac Ha Co., Ltd | Kraft paper production |
| 43 | Phu Giang Paper and Packaging Company | Production and trading of paper and carton packaging |
| 44 | May Yes Vina Co.Ltd | Textile and garment production |
| 45 | Soc Trang Public Works JSC | Public service |
| 46 | Sagasiki Vietnam Co., Ltd | Production, export and trading |
| 47 | An Binh Dang Co., Ltd | |
| 48 | An Thai Thinh Production and Trading Co., Ltd | Production of PP packaging |
| 49 | Tin Thanh Packaging JSC | Producing complex soft plastic packaging |
| 50 | Binh Dinh Pharmaceutical and Medical Equipment JSC | Manufacturing and trading pharmaceutical products and medical equipment |
| 51 | Asia Pacific Engineering Compounds Co. Ltd | Producing technical plastic pellet from recycling plastic materials |
| 52 | Cheng Long Binh Duong Paper Co., Ltd | Paper production |
| 53 | Hoa Chan JSC | Production and trading plastic pellet |
| 54 | CX Technology JSC (Vietnam) | Production of speaker components |
| 55 | Dea Young Vina Co., Ltd | Production of rubber label of sports shoes |

| No | Company | Activity |
|---|---|---|
| 56 | Dunam Chemistry Vina Co., Ltd | Production and process of plastic pellets and color plastic pellets |
| 57 | Garthern Việt Nam Co., Ltd | Production of electronic components |
| 58 | Muc Son Paper Co., Ltd | Production and trading of paper packaging, kraftt |
| 59 | Sai Gon Paper Co., Ltd | Production of carton and houshold paper from recycling paper |
| 60 | Sai Gon Mien Trung Paper Co., Ltd | Paper production |
| 61 | WINNER (VIET NAM) SHOE MATERIAL CO.,LTD | Production and process of shoes |
| 62 | Binh Sơn Refining and Petrochemical JSC | Production of petrolium products |
| 63 | Lee & Man Co., Ltd | Production of paper packaging |
| 64 | TCI Branch - An Khang Packaging Factory | Production and trading of packaging |
| 65 | TCT Liksin - Liksin Packaging Factory | Printing and producing composite film packaging |
| 66 | Liksin Paper Packaging Printing Factory | Production of packaging, paper boxes, wrinkled paper |
| 67 | Lucky Start Plast Co., Lts | Production of products from PP materials |
| 68 | URENCO Quang Binh | Collection, transportation and treatment of domestic waste |
| 69 | New Vietnam JSC | Production of car components |
| 70 | A CHAU LIMITED LIABILITY COMMERCIAL TECHNICAL COMPANY | Production and trading of chemicals and plastic |
| 71 | Phu An Production and Trading Co., Ltd | Production and trading of plastic products, plastic machinery and equipment |
| 72 | Phuc Tan Phat Co., Ltd | Production of paper packaging |
| 73 | VIETNAM COLOUR TRADING AND MANUFACTURING CO.,LTD | Production and trading of plastic materials |
| 74 | Tam Tan Co., Ltd | Production of PET bottle billet, HDPE cap |
| 75 | Tamron Optical JSC (Vietnam) | Production of optical lenses |
| 76 | Thai Kodama Co., Ltd (Vietnam) | Production of ABS, HIPS, PE, PP plastic sheets for household appliances production |
| 77 | Thuy Tu Co., Ltd | Recycling plastic scraps |
| 78 | Tipharco Pharmaceutical JSC | Production and trading pharmeceuticals |
| 79 | Chan Sinh Production and Trading Co., Ltd | Production of plastic film |
| 80 | Green Future Trading and Service Co., Ltd | |
| 81 | YAMAHA MOTOR PARTS MANUFACTURING VIETNAM CO., LTD | Manufacturing spare parts and accessories for motor vehicles and engines |
| 82 | Youngin vina Binh Duong co, LTD | Producing shoes, semi-finished products and accessories |
| 83 | YoungTex Vina JSC | Processing garments |
| 84 | Asia Nutrition Technologies Co., Ltd | Production of animal feed |
| 85 | Giang Bien Trading Co., Ltd | Production and export of Taiwanese joss paper |
| 86 | Hoa Lan Co., Ltd | Production of paper products |
| 87 | Non Nước Viet Travel Co., Ltd | Travel and production of joss paper |
| 88 | Trieu Dai Phat Co., Ltd | Production of paper packging |
| 89 | Duyet Cuong Co., Ltd | Production of joss paper |
| 90 | Phu Vuong Co., Ltd | Production of joss paper |
| 91 | MTV SX Giấy Huy Tiến On., Ltd | Production of joss paper |
| 92 | Tang Hung Production Trading and Service Co., Ltd | Production of toiler paper and tissue |
| 93 | Long Du Production Co., Ltd | Production of paper stamp |
| 94 | Viet Khanh An Co., Ltd | Production of joss paper |
| 95 | Phuc Tien Co., Ltd | Production of paper packging |
| 96 | Hong Thien Packaging and Core Barrer Production and Trading JSC | Producing paper core tubes |
| 97 | Tan Trung Dat Co., Ltd | Production of paper packging |
| 98 | Ngoc Lan Paper Trading and Production Private Company | Production of writing paper and printing paper |
| 99 | Br Vina Packaging Co., Ltd | Production of paper packging |
| 100 | Nhat Lai Environment Sanitary Service and Trading | Collection and transportation of domestic waste |
| 101 | Nghe An URENCO | Collection and treatment of domestic waste |

| No | Company | Activity |
|---|---|---|
| 102 | Ninh Bình Environment and Urban Service JSC | Collection and transportation of domestic waste |
| 103 | Ben Tre Pharmaceutical JSC | Production and trading of food |
| 104 | Cat Loi JSC | Printing packaging, producing filter and accessories cigarette |
| 105 | HA LONG CANNED FOOD JOINT STOCK CORPORATION | Producing canned tuna |
| 106 | MJ APPAREL Co, Ltd | Production and processing of garments |
| 107 | Plastic Additive JSC | Production of additives for plastic industry |
| 108 | Dong Hai Ben Tre JSC | Production of Kraf industry paper, packaging carton |
| 109 | Hung Phat Urban Environment Co. Ltd | Collection, transportation and recycling waste, purchasing scraps |
| 110 | Viet Trung Environmental Technology Co., Ltd | Production of plastic film and packaging |
| 111 | Can Tho Mechanical Electrical Mechinery JSC | Production of packaging carton |
| 112 | Dương Liêen Nghi Co., Ltd | Trading of paper scraps |
| 113 | Xuan Mai Paper Co., Ltd | Paper production |
| 114 | Hoang Tan Production and Trade of Business JSC | Production of soap |
| 115 | Donanewtower Natural Drink and Food JSC | Production of beverage |
| 116 | Transworld Logistics Company | Logistics |
| 117 | Kosin Việt Nam Co., Ltd | Processing paper splint |
| 118 | Tai Thanh Phat Co., Ltd | Collecting and purchasing scraps |
| 119 | Thai Duc Phat Co., Ltd | Collecting and purchasing scraps |
| 120 | Lac Tien Phat Co., Ltd | Purchasing scraps |
| 121 | Phong Nghia Private Company | Purchasing scraps |
| 122 | Loc An Trading and Service Corperation | Trade of scraps |
| 123 | Thanh Phat Co., Ltd | Purchasing scraps |
| 124 | KSA Polymer Hanoi JSC | Production of canvas, paper tube, nylon |
| 125 | Wipro Unza Việt Nam Co., Ltd | Production of cosmetic |
| 126 | Sông Xanh Co., Ltd | Landfilling waste |
| 127 | Phuc An An Scraps Trading and Service Co., Ltd | Purchasing scraps |
| 128 | Do An Trading and Service Co., Ltd | Supplying foam |
| 129 | A Chau Packaging JSC | Production of packaging |
| 130 | Vinh Hue Paper JSC | Paper production |
| 131 | Bai Bang Paper Company | Production of writing paper and printing paper |
| 132 | Minh Hoang Co., Ltd | Production of wood chips and paper |
| 133 | Chau Thanh JSC | Social and public service |
| 134 | Kokuyo Viet Nam Co., Ltd | Paper production |
| 135 | Vpp Hoang Son Co., Ltd | Paper production |
| 136 | Minh Phuc Paper Co., Ltd | Paper production for garment and leather, shoes industry |
| 137 | Thanh Phat Plastic and Paper Packaging Co., Ltd | Production of printing paper |
| 138 | Phuc Quan Co., Ltd | Paper production |
| 139 | Nguyen Vuong Packaging Production Co., Ltd | Paper production |
| 140 | Gia An Packaging Production and Printing Co., Ltd | Production of plastic product |
| 141 | Phuc Khanh Packaging Production and Trading Co., Ltd | Production of packaging |
| 142 | Duc Nguyen Phat Production and Trading Co., Ltd | Production of paper packaging |
| 143 | Dai Cat Packaging Production Trading and Service Co., Ltd | Paper production |
| 144 | Tan Thuan Thanh Production and Trading Co., Ltd | Paper production |

| No | Company | Activity |
|---|---|---|
| 145 | Son Nhat Packaging Production Trading and Printing Co., Ltd | Production of paper and plastic packaging, labels |
| 146 | Cheng Neng Co., Ltd | Paper production |
| 147 | Deal Easy Paper Co., Ltd | Paper production |
| 148 | Eltete Vietnam Co., Ltd | Paper production |
| 149 | Thai Nhat Paper Packaging Co., Ltd | Paper production |
| 150 | Kinh Thuan Co., Ltd | Paper production |
| 151 | Gia Gia Nghi Co., Ltd | Paper production |
| 152 | Trung Chang Tin Co., Ltd | Paper production |
| 153 | Hai Thanh Co., Ltd | Food processing |
| 154 | PORTSERCO Logistics JSC | Transportation and warehousing |
| 155 | Hoai Nhon Seafood JSC | Trading of petroleum, shipbuilding and hotel restaurants |
| 156 | Guyomarc'H Viet Nam Co., Ltd | Production of animal feed |
| 157 | Vinh Truong JSC | Paper production |
| 158 | Vinh Hoan JSC | Production of seafood |
| 159 | Yazaki Vietnam Co., Ltd | Production of conductor in cars |
| 160 | Nghenh Phong VN Co., Ltd | Production of exported sole |
| 161 | Kmc Chain Viet Nam Co., Ltd | Production of aluminium |
| 162 | Manh Quang Engineering Co., Ltd | Production of motorcycle sprocket |
| 163 | Yamazaki Technical Viet Nam Co., Ltd | Production of car ram body |
| 164 | Ohara Plastic Viet Nam Co., Ltd | Production of car plastic accessories |
| 165 | Cap Vina Co., Ltd | Production of car lever |
| 166 | Yahon Co., Ltd | Paper production |
| 167 | Hapaco Yen Son JSC, Van Yen Paper Factory | Paper production |
| 168 | Tissue Paper Trading Production Company Limited | Paper production |
| 169 | Taisun Co., Ltd (Vietnam) | Production of baby diapers and sanitary napkins |
| 170 | Dong Vuong Phat Paper Packaging Production Co., Ltd | Paper production |
| 171 | Ojitex Viet Nam Co., Ltd | Production carton paper |
| 172 | Toan Luc Co.,Ltd | Paper production |
| 173 | Duong Gia Packaging Trading and Service Co., Ltd | Paper production |
| 174 | SK Plastic Production Tranding and Service Co., Ltd | Production of plastic cladding |
| 175 | Nhu Hoa Production and Trading Co., Ltd | Production of recycled plastic resin |
| 176 | Quynh Quyen Hung Yen Production and Trading Co., Ltd | Purchasing plastic pellet from small craft villages |
| 177 | Ngoc Tram Hung Yen Trading and Production Co., Ltd | Purchase and production of plastic |
| 178 | Nam Son Hung Yen Co., Ltd | Production and trading of plastic |
| 179 | Truong Thuy Trading and Production Private Company | Production of recycling plastic pellet |
| 180 | Hoang Thien Tin Co., Ltd | Printing label |
| 181 | Woori Electric Co., Ltd | Processing telephone components |
| 182 | Phu Lam Plastic Industry JSC | Production of leatherette fabric and PVC film |
| 183 | Huyen Linh Paper Co., Ltd | Paper production vệ sinh và giấy ăn |
| 184 | Yuen Foong Yu Dong Nai Paper Co., Ltd | Carton box production |
| 185 | Huu Phat Facility | Pressing and gringing plastic |
| 186 | Hiep Phat Plastic Production and Trading Co., Ltd | Purchasing plastic pellet |
| 187 | Tan Hung Plastic Producion and Investment Co., Ltd | Trading and purchasing plastic pellet |
| 188 | Refine Viet Nam Co., Ltd | Production of jumbo packaging |
| 189 | Lan Cuong Plastic Recycling Facility | Plastic recycling |
| 190 | Dong Do Plastic and Chemical Co., Ltd | Plastic recycling |
| 191 | Dai Tin Production and Trading Co., Ltd | PE Plastic recycling |
| 192 | Phu Huu Production and Trading Co., Ltd | Printing sản phẩm màng nhựa |

| No | Company | Activity |
|---|---|---|
| 193 | Trinh Nghien JSC | Plastic recycling |
| 194 | Hoang Ha Paper JSC | Purchasing paper scraps, producing roll paper |
| 195 | Dai Luc Quang minh JSC | Collecting and purchasing scraps |
| 196 | An Hung Co., Ltd | Paper production |
| 197 | Long Vi Paper Factory | Paper production |
| 198 | Bao Quan Environment Co., Ltd | Collection and transportation of domestic scraps |
| 199 | Shun An Environment Technology Co., Ltd | Production of plastic pellet |
| 200 | Tuan Dat Trading and Production Co., Ltd | Production of plastic packaging and bottle |
| 201 | Nidec Servo Vietnam Co., Ltd | Production of electronic components |
| 202 | Nidec Sankyo Viet Nam Co., Ltd | Electronic components |
| 203 | Greystones Data Systems Viet Nam Co., Ltd | Electronic |
| 204 | Wondo Vina Co., Ltd | Textile |
| 205 | MSV Co., Ltd | Textile |
| 206 | PNG Vietnam Co., Ltd | Textile |
| 207 | F.L.D VIET NAM CO.,LTD | Textile |
| 208 | Pho Hien Garment JSC | Textile |
| 209 | Phuong Nguyen Trading Co., Ltd | Trading, purchasing and importing plastic |
| 210 | Dong Nai Viet Vinh Shoes Co., Ltd | Production of shoes |
| 211 | Fashy Vien Dong Co., Ltd | Garment |
| 212 | Jungwoo Vina Co., Ltd | Textile |
| 213 | VIETNAM DONA GOLD LONG JOHN INTERNATIONAL CO ., LTD. | Textile dyeing |
| 214 | Tongkook Vietnam Spinning Co., Ltd | Spining |
| 215 | Thang Long Shoes JSC | Production of shoes |
| 216 | Thanh Luan Shoes Production Company | Production of shoes |
| 217 | Thanh Tri Garment JSC | Sewing clothes |
| 218 | Hai Phong Paper JSC | Production of paper roll |
| 219 | Hai Duong Paper JSC | Paper production |
| 220 | Foster (Quang Ngai) Electronic Co., Ltd | Electronic |
| 221 | Samyang Vina Co., Ltd | Production of shoes |
| 222 | Hochiminh Oncology Hospotal | Medical service |
| 223 | Tan Luong Vietnam Co., Ltd | Trading plastic |
| 224 | Trung Thien Production and Trading Co., Ltd | Production of plastic pellet, pipe |
| 225 | Hoang Minh Packaging Corporation | Production of plastic pellet |
| 226 | Longhi Technology VietNam Co., Ltd | Production of plastic pellet |
| 227 | Trong Khang Trading and Production Co., Ltd | Production of plastic pellet |
| 228 | Win Vina Co., Ltd | Sewing swimming clothes |
| 229 | Hong Seng Thai Vina Co., Ltd | Textile |
| 230 | Hop Thanh Co., Ltd | Sewing workwear clothes |
| 231 | Song Hong Garment JSC | Textile |
| 232 | HQ Collecting and Purchasing Scraps Center | Collecting and purchasing scraps |
| 233 | Sao Viet Nhat Import and Export JSC | Production of papre product |
| 234 | Ha Phuong Production and Trading Co., Ltd | Production of joss paper |
| 235 | DAH SHENG INTERNATIONAL (VIETNAM) CO., LTD | Garment |
| 236 | Proceeding Co., Ltd | Garment |
| 237 | Viet Tien Garment Corporation | Production of clothings |
| 238 | VIETNAM LEIOULA GARMENT CO., LTD | Garment |
| 239 | Vina Korea Co., Ltd | Garment |
| 240 | Viet Hung Packaging Co., Ltd | Production of paper packaging |
| 241 | Vietnam Paper Corporation | Paper production |
| 242 | Vy Tuyen Co., Ltd | Production of plastic pellet |
| 243 | Phuong Ha Co., Ltd | Production of packaging carton |
| 244 | Petrovietnam Packaging JSC | Production of plastic packaging |

| No | Company | Activity |
|---|---|---|
| 245 | Tien Thanh JSC | Production of paper packaging |
| 246 | Duc Thinh JSC | Production of paper packaging |
| 247 | Trung Viet Huy Hoang Packaging and Printing Co., Ltd | Paper production |
| 248 | Hung Thinh Paper Co., Ltd Bac Ninh | Paper production |
| 249 | Phuc Anh Paper Co., Ltd | Production of toiler paper and tissue |
| 250 | Rkw Vietnam Co., Ltd | Production of packaging plastic |
| 251 | PQ Vina Co., Ltd | Paper production |
| 252 | Tan Viet Phat Paper JSC | Paper production |
| 253 | Yotsuba Dress Vietnam Company | Garment |
| 254 | Nam Dinh Garment Textile Joint Stock Corporation | Textile |
| 255 | Sung Yin Vina Co., Ltd | Garment |
| 256 | Tai Ryong Việt Nam Co., Ltd | Garment |
| 257 | Nguyen Huy Co., Ltd | Paper production |
| 258 | Tham Trang Co., Ltd | Production of paper packaging |
| 259 | Angel Vietnam JSC | Production of plastic |
| 260 | Lien Son Paper Co., Ltd | Paper production |
| 261 | Minh Thanh Plastic Trading Service and Production Co., Ltd | Production of recycling plastic pellet |
| 262 | Asian Chemicals Plastic Co., Ltd | Production of primary plastic pellet |
| 263 | Khai Thanh Trading and Production JSC | Production of yarn, cotton, blanket, pillow, cushion |
| 264 | Sam Hwan Vina Co., Ltd | Production of plastic belt |
| 265 | Tung Duong Packaging Co., Ltd | Production of packaging |
| 266 | Mai Tan Dat Co., Ltd | Trading, purchasing plastic packaging scraps |
| 267 | Phan Thiet Public Works Co., Ltd | Public service |
| 268 | Binh Phuong Green Environmental Technology Co. Ltd | Treatment of hazadous waste and industrial waste |
| 269 | Minh Thong Production, Trading and Service Co., Ltd | Collection, transportation and treatment of domestic waste |
| 270 | Truong Giang Garment JSC | Garment |
| 271 | Huu Tri Production Trading and Service Co., Ltd | Collecting and purchasing scraps |
| 272 | Gia Quang Environment Treatment Trading and Service Co., Ltd | Collecting and purchasing scraps |
| 273 | Park Corp Việt Nam Co., Ltd | Production of leather bag |
| 274 | Young Il Viet Nam Co., Ltd | Paper production |
| 275 | Binh Phuoc Environment JSC | Collection, transportation and treatment of hazadous waste and industrial waste |
| 276 | Hieu Lap Garment Co., Ltd | Garment |
| 277 | HOANG HUY CONSTRUCTION, INVESTMENT AND TRADING JSC | Wallpaper |
| 278 | Viet Xanh Service and Trading JSC | Production of products from paper and board |
| 279 | APPARELTECH VINH LOC GARMENT EXPORT COMPANY LIMITED | Garment |
| 280 | Can Tho Sadico JSC | Production of plastic |
| 281 | Tan Phu Plastic JSC | Production of plastic |
| 282 | Oai Hung Production JSC | |
| 283 | Tan Hiep Loi Plastic Packaging Co., Ltd | Production of plastic packaging |
| 284 | Tran Bao Environment Co., Ltd | Purchasing scraps |
| 285 | Dien Bien Urban Environment and Construction JSC | Collection and transportation of domestic waste |
| 286 | Vinh Yen Environment and Urban Service JSC | Collection and treatment of solid waste |
| 287 | Dong A JSC | Production of carton board |
| 288 | Minh Dung Packaging Private Company | Production of packaging |
| 289 | Ha Hung Co., Ltd | Production of packaging |
| 290 | Phuc Lai Co., Ltd | Producing and printing plastic packaging |

| No | Company | Activity |
|---|---|---|
| 291 | Tan Thuan Thien Packaging Production Co., Ltd | Production of packaging |
| 292 | Goldsun Printing and Packaging JSC | Production of packaging |
| 293 | Ngoc Viet Paper JSC | Paper production |
| 294 | Sao Mai Corporation | Paper production |
| 295 | FC Vietnam Co, Ltd | Production of plastic |
| 296 | Vinh Thanh Co., Ltd | |
| 297 | HACAMY PLASTIC-CONTRUCTION TRADING CO.,LTD | Production of household plastic |
| 298 | Saigon Plastic Color Co., Ltd | Production of plastic |
| 299 | Tam Sao Production and Trading Co., Ltd | Production of plastic packaging |
| 300 | Thuan Tri Plastic Packaging Production and Trading Co., Ltd | Production of plastic packaging and plastic household |
| 301 | Uong Bi Environment and Public Works JSC | Service of domestic waste |
| 302 | Viet Long Investment and Construction JSC | Treatment of domestic waste |
| 303 | Quang Nam Uran Environment Co., Ltd | Treatment service of domestic waste |
| 304 | Tan Ngoc Phat Plastic Packaging Co., Ltd | Production of plastic packaging |
| 305 | Vi Lam Trading Company | Paper production |
| 306 | Dai Phu Si Environment Treatment JSC | Industrial waste services |
| 307 | A Chau Environment Co., Ltd | Transportation and collection of waste |
| 308 | Oriya Viet Nam Co., Ltd | Production of writing paper and printing paper |
| 309 | Tae Kwang Vina Industrial Co., Ltd | Producer for Nike |
| 310 | Flexicon Viet Nam JSC | Production of industrial thread |
| 311 | Tropical Hospoital | Clinic |
| 312 | S& K Vietnam Co., Ltd | Packaging paper |

***Table 21. List of survey respondents***

# 3.2. Annex 2. Survey results

## 3.2.1. All respondents

| ALL | | | | |
|---|---|---|---|---|
| **Number of respondent** | **312** | | | |
| Consumer only | 93 | **Cosumer** | **103** | |
| Producer only | 142 | **Producer** | **171** | |
| Waste service only | 48 | **Waste service** | **69** | |
| Consumer & Producer | *8* | | | |
| Consumer and waste | *0* | | | |
| Producer and waste | *19* | | | |
| Consumer, producer and waste | *2* | | | |
| **Ownership** | **Consumer** | **Producer** | **Waste** | **All** |
| State-owned | 14 | 9 | 7 | 28 |
| Private | 41 | 121 | 58 | 196 |
| Joint venture | 2 | 8 | 1 | 11 |

| | | | | |
|---|---|---|---|---|
| FDI | 46 | 33 | 3 | 77 |
| **Operation size** | **Consumer** | **Producer** | **Waste** | **All** |
| Large | 48 | 27 | 10 | 77 |
| Medium | 25 | 30 | 8 | 58 |
| Smalll | 28 | 86 | 26 | 127 |
| Super small | 2 | 27 | 25 | 49 |
| N/A | 0 | 1 | 0 | 1 |
| **Year of establishment** | **Consumer** | **Producer** | **Waste** | **All** |
| More than 20 years | 30 | 23 | 7 | 55 |
| 10-20 years | 35 | 83 | 18 | 123 |
| 5-10 years | 22 | 45 | 23 | 81 |
| Less than 5 year | 8 | 16 | 11 | 32 |
| No information | 8 | 4 | 10 | 21 |
| **Consumer** | **Respondents** | | **Role** | |
| Food and beverage | 7 | 7% | **End user** | 0% |
| Textile and foodware | 45 | 42% | **Intermdiate user** | 0% |
| Electtronics | 7 | 7% | | |
| Chemical & Printing | 12 | 11% | End user | 0 |
| Other industry | 26 | 24% | Intermdiate user | 0 |
| Public and home use | 8 | 7% | | |
| Multiple sector | 2 | 2% | | |
| **Producers** | **Respondent** | | | |
| Paper: Finishing only | 47 | 27% | | |
| Paper: Scrap to hydraulic | 38 | 22% | | |
| Plastic: Extrusion | 35 | 20% | | |
| Plastic: Injection molding | 19 | 11% | | |
| Plastic: Blow molding | 15 | 9% | | |
| Paper: Pulp to paper making | 10 | 6% | | |
| Plastic & Paper: Not describe | 8 | 5% | | |
| Plastic: CNC | 7 | 4% | | |
| Plastic: Rolling, pulling, thread making | 5 | 3% | | |
| Plastic: Vacum forming | 5 | 3% | | |
| Paper: Kraft (Sunphate) | 4 | 2% | | |
| Plastic: Resin forming | 4 | 2% | | |
| Plastic: 3D | 2 | 1% | | |
| Plastic: Rotation molding | 2 | 1% | | |
| Paper: Cold soda | 1 | 1% | | |
| Plastic: Weaving | 1 | 1% | | |
| Paper: BCTMP | 0 | 0% | | |
| Paper: soda | 0 | 0% | | |
| Paper: CTMP | 0 | 0% | | |
| **Waste service** | **Respondent** | **Service provided: ALL** | **Only service provided: ALL** | |
| Collecting | 55 | 80% | 3% | |
| Transportation | 34 | 49% | 0% | |
| Sorting | 31 | 45% | 0% | |
| Resin/pulp/paper production | 18 | 26% | 4% | |
| Pre-treatment | 15 | 22% | 0% | |
| Trading | 12 | 17% | 9% | |
| Import | 11 | 16% | 3% | |
| Landfill | 7 | 10% | 0% | |
| Export | 3 | 4% | 0% | |
| Incineration | 2 | 3% | 1% | |
| **Waste hanndling and treatment** | **Consumer: ALL** | **Producer: ALL** | **Waste: ALL** | **All: ALL** |
| Sold to recycle | 78% | 43% | 50% | 53% |
| In-door recycling | 56% | 48% | 69% | 49% |
| Outsouce to collect | 38% | 30% | 19% | 30% |
| Disposal | 47% | 21% | 50% | 28% |

| | | | | |
|---|---|---|---|---|
| Return to supplier | 0% | 3% | 0% | 2% |
| **Most handling in quantity** | **Consumer: ALL** | **Producer: ALL** | **Waste: ALL** | **All: ALL** |
| Most: Sold to recycle | 46% | 31% | 25% | 37% |
| Most: In-door recycling | 29% | 40% | 46% | 35% |
| Most: Disposal | 14% | 9% | 21% | 12% |
| Most: Outsouce to collect | 10% | 18% | 8% | 15% |
| Most: Return to supplier | 0% | 2% | 0% | 2% |
| **Activity** | **Consumer** | **Producer** | | |
| Requirement on ratio of reccycled materials | 10% | 7% | | |
| Recycle used plastic/paper items | 8% | 18% | | |
| Reduction of demand (only consumer) | 13% | 0% | | |
| Reuse waste material (Producer) | 0% | 31% | | |
| Activities under circular econoy | 24% | 44% | | |
| **Motivation** | **Consumer** | **Producer** | | |
| Lower purchase cost | 64% | 48% | | |
| Compliance | 52% | 13% | | |
| Greenner conssumer / supply chain | 40% | 29% | | |
| No motivation listed | 0% | 0% | | |
| **Constraint** | **Consumer** | **Producer** | **Waste** | **All** |
| Quallity requirement | 48% | 59% | 23% | 66% |
| Availability of scrap (producer, waste) | 0% | 34% | 50% | 45% |
| Higher purchase cost | 39% | 29% | 0% | 34% |
| Compliance | 42% | 24% | 0% | 32% |
| Investment cost (waste) | 0% | 0% | 70% | 30% |
| Capacity of recycle, recovery | 19% | 7% | 7% | 18% |
| Technology (producer, waste) | 0% | 5% | 17% | 11% |
| Capacity of collection system | 16% | 0% | 0% | 7% |
| Capaciity of producer | 13% | 0% | 0% | 6% |
| **Support to market development** | **Consumer** | **Producer** | **Waste** | **All** |
| Yes, to develop | 71% | 74% | 87% | 74% |
| No, not to devvelop | 20% | 22% | 12% | 21% |
| No answer | 9% | 4% | 1% | 5% |
| **Interest in market** | **Consumer** | **Producer** | **Waste** | **All** |
| Yes, interested | 31% | 52% | 59% | 44% |
| No, not interested | 4% | 1% | 1% | 2% |
| Dont know | 65% | 47% | 39% | 54% |
| **Interest in market** | **Consumer** | **Producer** | **Waste** | **All** |
| Large | 27% | 81% | 50% | 43% |
| Medium | 44% | 33% | 63% | 38% |
| Small & Supersmall | 27% | 50% | 61% | 47% |
| Smalll | 21% | 53% | 54% | 45% |
| Super small | 100% | 41% | 68% | 51% |
| **Location (Medium and Large respondentts)** | | | | |
| No | **Consumer** | **Producer** | **Waste** | **All** |
| 1 | Ha Noi | Ho Chi Minh City | Ho Chi Minh City | Ho Chi Minh City |
| 2 | Ho Chi Minh City | Binh Duong | Dong Nai | Dong Nai |
| 3 | Dong Nai | Hung Yen | Binh Duong | Binh Duong |
| 4 | Binh Duong | Long An | Hung Yen | Ha Noi |
| 5 | Hai Phong | Dong Nai | Ha Noi | Hai Phong |
| 6 | Thanh Hoa | Hai Phong | Long An | Hung Yen |
| 7 | Long An | Bac Ninh | Bac Ninh | Long An |
| 8 | Da Nang | Ha Noi | Vinh Phuc | Bac Ninh |

| | | | | |
|---|---|---|---|---|
| 9 | Vinh Phuc | Phu Tho | Quang Ninh | Phu Tho |
| 10 | Tien Giang | Hai Duong | Quang Nam | Thanh Hoa |
| **Location (Medium and Large respondentts)** | **Consumer** | **Producer** | **Waste** | **All** |
| Ho Chi Minh City | 15 | 43 | 10 | 10 |
| Dong Nai | 14 | 12 | 8 | 8 |
| Binh Duong | 8 | 17 | 7 | 7 |
| Ha Noi | 16 | 8 | 4 | 4 |
| Hai Phong | 6 | 11 | 2 | 2 |
| Hung Yen | 1 | 14 | 5 | 5 |
| Long An | 3 | 12 | 3 | 3 |
| Bac Ninh | 1 | 10 | 3 | 3 |
| Phu Tho | 2 | 7 | 1 | 1 |
| Thanh Hoa | 5 | 2 | 0 | 0 |

***Table 22. Survey results of all respondents***

### 3.2.2. Plastic

| PLASTIC | | | | |
|---|---|---|---|---|
| **Number of respondent** | **178** | | | |
| Consumer only | 61 | **Cosumer** | **67** | |
| Producer only | 52 | **Producer** | **73** | |
| Waste service only | 44 | **Waste service** | **60** | |
| Consumer & Producer | *5* | | | |
| Consumer and waste | *0* | | | |
| Producer and waste | *15* | | | |
| Consumer, producer and waste | *1* | | | |
| **Ownership** | **Consumer** | **Producer** | **Waste** | **All** |
| State-owned | 13 | 4 | 7 | 22 |
| Private | 20 | 45 | 49 | 99 |
| Joint venture | 1 | 2 | 1 | 4 |
| FDI | 33 | 22 | 3 | 53 |
| **Operation size** | **Consumer** | **Producer** | **Waste** | **All** |
| Large | 38 | 16 | 9 | 56 |
| Medium | 19 | 11 | 7 | 36 |

| | | | | |
|---|---|---|---|---|
| Smalll | 9 | 37 | 21 | 57 |
| Super small | 1 | 9 | 23 | 29 |
| N/A | 0 | 0 | 0 | 0 |
| **Year of establishment** | **Consumer** | **Producer** | **Waste** | **All** |
| More than 20 years | 23 | 9 | 5 | 36 |
| 10-20 years | 18 | 34 | 14 | 56 |
| 5-10 years | 17 | 20 | 21 | 51 |
| Less than 5 year | 5 | 8 | 10 | 20 |
| No information | 4 | 2 | 10 | 15 |
| **Consumer** | **Respondents** | | **Role** | |
| Food and beverage | 4 | 6% | **End user** | 7% |
| Textile and foodware | 37 | 54% | **Intermdiate user** | 93% |
| Electtronics | 6 | 9% | | |
| Chemical & Printing | 3 | 4% | End user | 5 |
| Other industry | 13 | 19% | Intermdiate user | 62 |
| Public and home use | 5 | 7% | | |
| Multiple sector | 1 | 1% | | |
| **Producers** | **Respondent** | | | |
| Plastic: Extrusion | 35 | 48% | | |
| Plastic: Injection molding | 19 | 26% | | |
| Plastic: Blow molding | 15 | 21% | | |
| Plastic: CNC | 7 | 10% | | |
| Plastic: Rolling, pulling, thread making | 5 | 7% | | |
| Plastic: Vacum forming | 5 | 7% | | |
| Plastic & Paper: Not describe | 4 | 5% | | |
| Plastic: Resin forming | 4 | 5% | | |
| Plastic: 3D | 2 | 3% | | |
| Plastic: Rotation molding | 2 | 3% | | |
| Plastic: Weaving | 1 | 1% | | |
| **Waste service** | **Respondent** | **Service provided: PLASTIC** | **Only service provided: PLASTIC** | |
| Collecting | 49 | 82% | 2% | |
| Transportation | 31 | 52% | 0% | |
| Sorting | 27 | 45% | 0% | |
| Resin/pulp/paper production | 16 | 27% | 5% | |
| Pre-treatment | 14 | 23% | 0% | |
| Trading | 11 | 18% | 10% | |
| Import | 7 | 12% | 0% | |
| Landfill | 7 | 12% | 0% | |
| Incineration | 2 | 3% | 2% | |
| Export | 2 | 3% | 0% | |
| **Materials to Producers** | **Consumer** | **Producer** | **Waste** | |
| PETE/PET | 13% | 29% | 47% | |
| HDPE | 15% | 42% | 42% | |
| LDPE | 12% | 32% | 33% | |
| PVC | 15% | 23% | 33% | |
| Disposal, incineratiion | 0% | 0% | 23% | |
| Recycled plastic resin | 0% | 15% | 17% | |
| PP | 16% | 48% | 8% | |
| PE | 0% | 0% | 7% | |
| Recycled plastic | 9% | 0% | 3% | |
| PS | 1% | 11% | 3% | |
| Not described (import) | 0% | 0% | 0% | |
| Mícelaneous | 0% | 19% | 0% | |
| Not specified | 61% | 0% | 0% | |
| **Source of materials** | **Consummer** | | | |
| Consumer purchases100% from Vietnam | 47 | 70% | | |

| | | | | |
|---|---|---|---|---|
| Consumer imports | 19 | 28% | | |
| N/A | 1 | 1% | | |
| **Reason for import** | **Consummer** | | | |
| No reason provided | 7 | 29% | | |
| Import due to client request | 6 | 25% | | |
| Import due to quality | 5 | 21% | | |
| Import due to not available in country | 2 | 8% | | |
| Import due to environment | 2 | 8% | | |
| Import due to price | 2 | 3% | | |
| **Products to Consumers** | **Consumer: PLASTIC** | **Producer: PLASTIC** | **Waste: PLASTIC** | |
| Packaging plastic | 91% | 63% | 72% | |
| Technical plastic | 30% | 21% | 48% | |
| Domestic plastic | 21% | 18% | 47% | |
| Construction plastic | 16% | 11% | 45% | |
| Other plastic | 7% | 5% | 30% | |
| Resin (new, recycle) | 0% | 27% | 17% | |
| **Waste to treat** | **Consumer: PLASTIC** | **Producer: PLASTIC** | **Waste: PLASTIC** | |
| Waste - Packaging plastic | 45% | 42% | 17% | |
| Waste - Technical plastic | 19% | 18% | 8% | |
| Waste - Domestic plastic | 15% | 12% | 12% | |
| Waste - Construction plastic | 15% | 8% | 7% | |
| Waste - Other plastic | 10% | 4% | 2% | |
| Waste - Resin (new, recycle) | 0% | 27% | 17% | |
| **Waste hanndling and treatment** | **Consumer: PLASTIC** | **Producer: PLASTIC** | **Waste: PLASTIC** | **All: PLASTIC** |
| Sold to recycle | 75% | 37% | 50% | 51% |
| In-door recycling | 32% | 56% | 57% | 44% |
| Outsouce to collect | 32% | 42% | 36% | 36% |
| Disposal | 46% | 28% | 57% | 35% |
| Return to supplier | 0% | 0% | 0% | 0% |
| **Most handling in quantity** | **Consumer: PLASTIC** | **Producer: PLASTIC** | **Waste: PLASTIC** | **All: PLASTIC** |
| Most: Sold to recycle | 53% | 24% | 25% | 35% |
| Most: Disposal | 22% | 11% | 25% | 17% |
| Most: In-door recycling | 14% | 42% | 40% | 30% |
| Most: Outsouce to collect | 11% | 24% | 10% | 18% |
| Most: Return to supplier | 0% | 0% | 0% | 0% |
| **Capacity** | **Consumer: PLASTIC** | **Producer: PLASTIC** | **Waste: PLASTIC** | |
| Under expansion | 7% | 11% | 8% | |
| >10,000 | 0% | 22% | 0% | |
| >5,000 | 7% | 0% | 20% | |
| 5,000-10,000 | 0% | 16% | 0% | |
| 2,000-5,000 | 3% | 11% | 3% | |
| 500-2,000 | 6% | 19% | 15% | |
| <500 | 0% | 30% | 0% | |
| 100-500 | 10% | 0% | 23% | |
| <100 | 72% | 0% | 38% | |
| N/A | 1% | 1% | 0% | |
| | | | | |
| **Activity** | **Consumer** | **Producer** | | |
| Requirement on ratio of reccycled materials | 7% | 7% | | |
| Recycle used plastic/paper items | 12% | 25% | | |
| Reduction of demand (only consumer) | 18% | 0% | | |
| Reuse waste material (Producer) | 0% | 40% | | |

| | | | | |
|---|---|---|---|---|
| Activities under circular econoy | 28% | 60% | | |
| **Motivation** | **Consumer** | **Producer** | | |
| Lower purchase cost | 79% | 55% | | |
| Compliance | 63% | 18% | | |
| Greenner conssumer / supply chain | 42% | 23% | | |
| No motivation listed | 0% | 0% | | |
| **Constraint** | **Consumer** | **Producer** | **Waste** | **All** |
| Quallity requirement | 48% | 71% | 21% | 69% |
| Availability of scrap (producer, waste) | 0% | 29% | 46% | 41% |
| Compliance | 52% | 33% | 0% | 41% |
| Investment cost (waste) | 0% | 0% | 71% | 35% |
| Higher purchase cost | 35% | 21% | 0% | 27% |
| Capacity of recycle, recovery | 22% | 13% | 8% | 22% |
| Technology (producer, waste) | 0% | 8% | 17% | 14% |
| Capacity of collection system | 17% | 0% | 0% | 8% |
| Capaciity of producer | 13% | 0% | 0% | 6% |
| | | | | |
| **Support to market development** | **Consumer** | **Producer** | **Waste** | **All** |
| Yes, to develop | 79% | 86% | 85% | 83% |
| No, not to devvelop | 15% | 11% | 13% | 13% |
| No answer | 6% | 3% | 2% | 4% |
| **Interest in market** | **Consumer** | **Producer** | **Waste** | **All** |
| Yes, interested | 34% | 66% | 55% | 49% |
| No, not interested | 4% | 1% | 2% | 2% |
| Dont know | 61% | 33% | 43% | 49% |
| **Interest in market** | **Consumer** | **Producer** | **Waste** | **All** |
| Large | 32% | 81% | 44% | 41% |
| Medium | 37% | 18% | 57% | 33% |
| Small & Supersmall | 40% | 72% | 57% | 60% |
| Smalll | 33% | 76% | 48% | 61% |
| Super small | 100% | 56% | 65% | 59% |
| **Location (Medium and Large respondentts)** | | | | |
| No | **Consumer** | **Producer** | **Waste** | **All** |
| 1 | Ho Chi Minh City | Ho Chi Minh City | Ho Chi Minh City | Ho Chi Minh City |
| 2 | Dong Nai | Hung Yen | Dong Nai | Dong Nai |
| 3 | Ha Noi | Long An | Binh Duong | Binh Duong |
| 4 | Thanh Hoa | Dong Nai | Hung Yen | Hung Yen |
| 5 | Long An | Binh Duong | Long An | Long An |
| 6 | Hai Phong | Hai Phong | Ha Noi | Ha Noi |
| 7 | Vinh Phuc | Ha Noi | Bac Ninh | Vinh Phuc |
| 8 | Tien Giang | Vinh Phuc | Vinh Phuc | Hai Phong |
| 9 | Tay Ninh | Phu Tho | Quang Ninh | Thanh Hoa |
| 10 | Quang Ngai | Bac Ninh | Ninh Binh | Bac Ninh |
| **Location (Medium and Large respondentts)** | **Consumer** | **Producer** | **Waste** | **All** |
| Ho Chi Minh City | 12 | 24 | 8 | 8 |
| Dong Nai | 9 | 7 | 7 | 7 |
| Binh Duong | 2 | 4 | 7 | 7 |
| Hung Yen | 1 | 9 | 5 | 5 |
| Long An | 3 | 7 | 3 | 3 |
| Ha Noi | 5 | 3 | 3 | 3 |
| Vinh Phuc | 2 | 2 | 2 | 2 |

| | | | | |
|---|---|---|---|---|
| Hai Phong | 3 | 3 | 0 | 0 |
| Thanh Hoa | 4 | 0 | 0 | 0 |
| Bac Ninh | 0 | 2 | 3 | 3 |

***Table 23. Survey results from plastic sector***

### 3.2.3. Paper sector

| PAPER | | | | |
|---|---|---|---|---|
| **Number of respondent** | **228** | | | |
| Consumer only | 92 | **Cosumer** | **96** | |
| Producer only | 90 | **Producer** | **100** | |
| Waste service only | 36 | **Waste service** | **43** | |
| Consumer & Producer | *3* | | | |
| Consumer and waste | *0* | | | |
| Producer and waste | *6* | | | |
| Consumer, producer and waste | *1* | | | |
| **Ownership** | **Consumer** | **Producer** | **Waste** | **All** |
| State-owned | 12 | 5 | 7 | 24 |
| Private | 39 | 77 | 34 | 140 |
| Joint venture | 2 | 6 | 1 | 9 |
| FDI | 43 | 12 | 1 | 55 |
| **Operation size** | **Consumer** | **Producer** | **Waste** | **All** |
| Large | 45 | 13 | 7 | 62 |
| Medium | 23 | 19 | 7 | 45 |
| Smalll | 26 | 49 | 16 | 88 |
| Super small | 2 | 18 | 13 | 32 |
| N/A | 0 | 1 | 0 | 1 |

| Year of establishment | Consumer | Producer | Waste | All |
|---|---|---|---|---|
| More than 20 years | 28 | 14 | 7 | 45 |
| 10-20 years | 32 | 50 | 11 | 89 |
| 5-10 years | 20 | 26 | 13 | 56 |
| Less than 5 year | 8 | 8 | 6 | 22 |
| No information | 8 | 2 | 6 | 16 |
| **Consumer** | **Respondents** | | **Role** | |
| Food and beverage | 7 | 7% | **End user** | 7% |
| Textile and foodware | 44 | 44% | **Intermdiate user** | 93% |
| Electtronics | 6 | 6% | | |
| Chemical & Printing | 11 | 11% | End user | 7 |
| Other industry | 22 | 22% | Intermdiate user | 89 |
| Public and home use | 8 | 8% | | |
| Multiple sector | 2 | 2% | | |
| **Producers** | **Respondent** | | | |
| Paper: Finishing only | 47 | 47% | | |
| Paper: Scrap to hydraulic | 38 | 38% | | |
| Paper: Pulp to paper making | 10 | 10% | | |
| Paper: Kraft (Sunphate) | 4 | 4% | | |
| Paper: Cold soda | 1 | 1% | | |
| Paper: BCTMP | 0 | 0% | | |
| Paper: soda | 0 | 0% | | |
| Paper: CTMP | 0 | 0% | | |
| **Waste service** | **Respondent** | **Service provided: PAPER** | **Only service provided: PAPER** | |
| Collecting | 37 | 86% | 2% | |
| Transportation | 29 | 67% | 0% | |
| Sorting | 19 | 44% | 0% | |
| Pre-treatment | 9 | 21% | 0% | |
| Landfill | 7 | 16% | 0% | |
| Trading | 6 | 14% | 5% | |
| Import | 4 | 9% | 5% | |
| Incineration | 2 | 5% | 2% | |
| Resin/pulp/paper production | 2 | 5% | 2% | |
| Export | 1 | 2% | 0% | |
| **Materials to Producers** | **Consumer** | **Producer** | **Waste** | |
| OCC | 4% | 11% | 60% | |
| Disposal, incineratiion | 0% | 0% | 42% | |
| SOP | 1% | 13% | 37% | |
| ONP | 3% | 6% | 21% | |
| Paper product | 0% | 0% | 2% | |
| Recycled pulp | 1% | 9% | 2% | |
| Not described (import) | 0% | 7% | 0% | |
| Paper sheet | 0% | 5% | 0% | |
| Paper roll | 0% | 42% | 0% | |
| Shredded paper | 3% | 9% | 0% | |
| De-inking pulp | 6% | 11% | 0% | |
| Virgin pulp | 6% | 14% | 0% | |
| Not specified | 83% | 0% | 0% | |
| **Source of materials** | **Consummer** | | | |
| Consumer purchases100% from Vietnam | 78 | 81% | | |
| Consumer imports | 16 | 17% | | |
| N/A | 2 | 2% | | |
| **Reason for import** | **Consummer** | | | |
| Import due to quality | 8 | 30% | | |
| Import due to price | 7 | 7% | | |
| No reason provided | 5 | 19% | | |
| Import due to environment | 3 | 11% | | |

| | | | | |
|---|---|---|---|---|
| Import due to not available in country | 2 | 7% | | |
| Import due to client request | 2 | 7% | | |
| **Products to Consumers** | **Consumer: PAPER** | **Producer: PAPER** | **Waste: PAPER** | |
| Printing and writing paper | 88% | 18% | 47% | |
| Packaging paper | 79% | 74% | 70% | |
| Tissue and toletary | 56% | 14% | 30% | |
| Other paper | 5% | 5% | 37% | |
| Joss paper | 5% | 10% | 21% | |
| Pulp (new, recycled) | 0% | 0% | 2% | |
| **Waste to treat** | **Consumer: PAPER** | **Producer: PAPER** | **Waste: PAPER** | |
| Waste - Packaging paper | 47% | 38% | 9% | |
| Waste - Printing and writing paper | 44% | 21% | 5% | |
| Waste - Tissue and toletary | 21% | 9% | 5% | |
| Waste - Other paper | 14% | 24% | 0% | |
| Waste - Joss paper | 7% | 7% | 0% | |
| Waste - Pulp (new, recycled) | 0% | 0% | 2% | |
| **Waste hanndling and treatment** | **Consumer: PAPER** | **Producer: PAPER** | **Waste: PAPER** | **All: PAPER** |
| Sold to recycle | 61% | 47% | 44% | 53% |
| In-door recycling | 45% | 43% | 44% | 41% |
| Disposal | 33% | 17% | 33% | 24% |
| Outsouce to collect | 29% | 23% | 0% | 23% |
| Return to supplier | 0% | 4% | 0% | 2% |
| **Most handling in quantity** | **Consumer: PAPER** | **Producer: PAPER** | **Waste: PAPER** | **All: PAPER** |
| Most: Sold to recycle | 48% | 36% | 33% | 43% |
| Most: In-door recycling | 30% | 39% | 44% | 33% |
| Most: Disposal | 12% | 8% | 22% | 11% |
| Most: Outsouce to collect | 10% | 13% | 0% | 11% |
| Most: Return to supplier | 0% | 4% | 0% | 2% |
| **Capacity** | **Consumer: PAPER** | **Producer: PAPER** | **Waste: PAPER** | |
| Under expansion | 7% | 6% | 2% | |
| >200,000 | 0% | 14% | 0% | |
| 100,000-200,000 | 0% | 10% | 0% | |
| >100,000 | 0% | 0% | 5% | |
| >50,000 | 5% | 0% | 0% | |
| 50,000-100,000 | 0% | 12% | 2% | |
| 20,000-50,000 | 5% | 27% | 5% | |
| 5,000-20,000 | 3% | 0% | 16% | |
| <20,000 | 0% | 34% | 0% | |
| 1,000-5,000 | 10% | 0% | 0% | |
| <5,000 | 0% | 0% | 72% | |
| <1,000 | 74% | 0% | 0% | |
| N/A | 2% | 3% | 0% | |
| **Activity** | **Consumer** | **Producer** | | |
| Requirement on ratio of reccycled materials | 9% | 8% | | |
| Recycle used plastic/paper items | 5% | 14% | | |
| Reduction of demand (only consumer) | 11% | 0% | | |
| Reuse waste material (Producer) | 0% | 26% | | |
| Activities under circular econoy | 22% | 33% | | |
| **Motivation** | **Consumer** | **Producer** | | |
| Lower purchase cost | 62% | 39% | | |
| Compliance | 57% | 9% | | |
| Greenner conssumer / supply chain | 43% | 39% | | |
| No motivation listed | 0% | 0% | | |

| Constraint | Consumer | Producer | Waste | All |
|---|---|---|---|---|
| Quallity requirement | 45% | 39% | 14% | 41% |
| Availability of scrap (producer, waste) | 0% | 44% | 50% | 36% |
| Higher purchase cost | 41% | 44% | 0% | 36% |
| Investment cost (waste) | 0% | 0% | 68% | 27% |
| Compliance | 41% | 17% | 0% | 27% |
| Capacity of recycle, recovery | 21% | 6% | 5% | 16% |
| Capacity of collection system | 17% | 0% | 0% | 9% |
| Capaciity of producer | 14% | 0% | 0% | 7% |
| Technology (producer, waste) | 0% | 0% | 9% | 4% |
| | | | | |
| **Support to market development** | **Consumer** | **Producer** | **Waste** | **All** |
| Yes, to develop | 72% | 66% | 91% | 72% |
| No, not to devvelop | 20% | 30% | 7% | 23% |
| No answer | 8% | 4% | 2% | 5% |
| **Interest in market** | **Consumer** | **Producer** | **Waste** | **All** |
| Yes, interested | 30% | 42% | 51% | 37% |
| No, not interested | 4% | 1% | 2% | 2% |
| Dont know | 66% | 57% | 47% | 61% |
| **Interest in market** | **Consumer** | **Producer** | **Waste** | **All** |
| Large | 24% | 77% | 43% | 35% |
| Medium | 48% | 42% | 57% | 44% |
| Small & Supersmall | 25% | 36% | 52% | 35% |
| Smalll | 19% | 37% | 50% | 32% |
| Super small | 100% | 33% | 54% | 44% |
| **Location (Medium and Large respondentts)** | | | | |
| No | **Consumer** | **Producer** | **Waste** | **All** |
| 1 | Ha Noi | Ho Chi Minh City | Dong Nai | Ho Chi Minh City |
| 2 | Ho Chi Minh City | Binh Duong | Ho Chi Minh City | Dong Nai |
| 3 | Dong Nai | Bac Ninh | Binh Duong | Ha Noi |
| 4 | Binh Duong | Hai Phong | Ha Noi | Binh Duong |
| 5 | Hai Phong | Phu Tho | Bac Ninh | Hai Phong |
| 6 | Thanh Hoa | Long An | Vinh Phuc | Bac Ninh |
| 7 | Da Nang | Hung Yen | Quang Ninh | Phu Tho |
| 8 | Vinh Phuc | Ha Noi | Quang Nam | Long An |
| 9 | Tien Giang | Dong Nai | Ninh Binh | Thanh Hoa |
| 10 | Tay Ninh | Binh Dinh | Nghe An | Hung Yen |
| **Location (Medium and Large respondentts)** | **Consumer** | **Producer** | **Waste** | **All** |
| Ho Chi Minh City | 14 | 19 | 4 | 4 |
| Dong Nai | 13 | 5 | 6 | 6 |
| Ha Noi | 15 | 5 | 3 | 3 |
| Binh Duong | 7 | 13 | 4 | 4 |
| Hai Phong | 6 | 8 | 2 | 2 |
| Bac Ninh | 1 | 9 | 3 | 3 |
| Phu Tho | 2 | 6 | 1 | 1 |
| Long An | 2 | 5 | 1 | 1 |
| Thanh Hoa | 5 | 2 | 0 | 0 |
| Hung Yen | 1 | 5 | 0 | 0 |

***Table 24. Survey results in paper sector***

## 3.3. Annex 3. List of relevant legislation in Vietnam

Scrap and recycling management is regulated by the following legislations:

***Law on Environmental Protection 2014 (LEP 2014).*** Article 76 Environmental protection during import of scrap states that scrap imported into Vietnam must satisfy environmental standards and on the list of permissible scrap materials compiled by the Prime Minister.

***Decision No.73/2014/QD-TTg*** from December 19, 2014 of the Prime Minister regulating the list of scrap permitted to be imported from abroad as production materials. According to Decision, the list of scrap allowed to be imported from abroad as production materials including 36 types, of which the main groups are plastic, glass, paper, and metal.

***Government's Decree No.38/2015/NĐ-CP*** from April 24, 2015 on management of waste and scraps[12].

***Circular No.41/2015/TT-BTNMT*** from September 9, 2015 of MONRE on environmental protection in importing scrap as production materials. The Circular provides regulations on:
Certificate of eligibility for environmental protection in importing scrap as production material (Certification); Requirements on environmental protection in inspection and clearance of imported scrap: the provisions of import duty are responsible for actual inspection of goods.
Issuance of certificates in accordance with national technical regulations on environment for imported plastic and paper scraps as production materials

***Circular No.08/2018/TT-BTNMT and Circular No. 09/2018/TT-BTNMT*** from September 14, 2018 of MONRE on promulgating national technical standards on environment for 6 groups of imported scrap as production materials, including: Iron and steel; plastic (QCVN32:2018/BTNMT); paper (QCVN33:2018/BTNMT); glass; non-ferrous metal and blast furnace slag. In particular, in these two circulars, the state inspection agency for imported scrap quality is the Department of Natural Resources and Environment (DONRE) for where there are factories and production

[12] The Decree 38 requested to classify, manage waste from generation, collection, transportation and treatment and also regulated that:

- Some other articles set requirements on importing scraps for recycling as raw materials for some domestic production and regulations on management of wastes.
- Waste owner shall be responsible for recycling, pre-processing, recovering, co-treatment, heat recovery or contract with a service provider for waste and waste material management" (article 30)
- Infectious waste after disinfection shall be treated like ordinary waste by suitable methods (point b, Term 5, Article 49).
- Waste materials are imported for production should be stored in covered place with fire and dust prevention measures in place. The importers shall have facilities for recycle, recovery and impurities treatment per requirement and must deposit to ensure the import materials is stored properly (article 56).
- Waste importer is required to obtain license on environmental protection and the list is published by MONRE

facilities using imported scrap as production materials. With the above provisions, in the areas where there are no seaports, officials of DONRE must move to seaports to check the goods of enterprises.

***Directive No. 27/CT-TTg of the Prime Minister*** from September 17, 2018 on a number of urgent solutions to strengthen the management of import and use of imported scrap as production materials[13].

***Official Letter No. 3738/TCHQ-GSQL*** from June 26, 2018 of the General Department of Customs (under the Ministry of Finance) on the management of imported scrap. This requires provincial Customs Departments to send imported scrap samples to the Customs Inspection Department for quality analysis and assessment according to QCVN before customs clearance. This inspection process applies to all imported scrap shipments.

***Decision No.491/QD-TTg*** from May 07, 2018 of the Prime Minister on adjustments to National Strategy for General management of solid waste to 2025 with vision to 2050 emphasized that generated solid waste must be managed in the direction of being considered as a natural resource, classified and collected in accordance with the selected treatment technology; Encouraging the treatment of waste into raw materials, fuels, environmental friendly products, waste treatment combined with energy recovery, saving land and suitable to natural and economic conditions of specific region and country.

***Circular No.01/2019/TT-BTNMT*** from March 8, 2019 of MONRE regulating the suspension of enforcement of some provisions of Circular No.08/2018/TT-BTNMT and Circular No.09/2018/TT-BTNMT of MONRE promulgates national technical regulations on environment. Accordingly, the Circular regulates to stop enforcing some provisions to shorten the clearance time for a business.

***Resolution No.09/2019/NQ-CP*** from February 3, 2019 of the Prime Minister from the Government meeting No.1, chapter on management of import and use of imported scrap as production materials. This assigned MONRE to be in charge of state management of solid waste and requested MONRE to review, complete,

[13] Directive 27 requests relevant agencies to tighten control of the import of scrap materials and use imported scrap in production, including:

- Do not grant new certificate, not extend the certificate for the unit entrusted to import scrap materials as production materials.
- Request MONRE to review, complete, supplement, develop legal documents on environmental protection in importing scrap in the prescribed direction tight environmental protection conditions for establishments using imported scrap as production materials.
- Request MONRE to submit to the Prime Minister for promulgation the list of imported scrap as production materials according to the shortened process.

supplement, develop legal documents on environmental protection in importing scrap for production purposes. Particularly for plastic scrap, it is allowed to import as raw materials for the production of plastic sticks only by December 31, 2024.

***Government's Decree No.40/2019/ND-CP*** from May 13, 2019 on amending and supplementing several articles of regulations of LEP (Decree 40). The Decree amends and supplements a number of Decrees including Decree No. 38/2015/ND-CP on managing waste and scrap. Decree 40 approves supplementing list of 3 groups of industrial production types with risk of environment pollution**.** Treating, recycling waste, using imported scrap to make material for production is under the group 2. In compliance with new regulation, scrap imported to make production material must satisfy regulation at Clause 1, Article 76 of LEP[14]. On the Conditions for import of organizations and individuals, Decree 40 indicates that organizations, individuals which have facilities using imported scrap must meet requirements before importing scrap to make production material[15].

Apart from above mentioned policy, the recycling industry including paper and plastic is affected by the following laws and regulations:

- Circular No.31/2016/TT-BTNMT on environmental protection of industrial clusters, concentrate businesses, service providers, craft villages, production, commercial and service establishments
- Decision No.10508/QD-BCT approving the Planning on development of Vietnam's paper industry by 2020, with a vision to 2025[16]
- Decision No 2992/QD-BCT on master plan for plastic sector to 2020 with vision to 2025

[14] Organization, individual importing scrap can fulfill procedures at either importing border gate management custom agency or at custom agency where the plant or facility using imported scrap (production facility) is located; can select place of inspection on the imported scrap quality at either importing border gate or at custom agency where the plant or facility using imported scrap is located or at site of the production facility using imported scrap.
Imported scrap shall be discharged from ship only upon satisfying with following request: (i) Organizations, individuals receiving goods on E-manifest must obtain valid Certificate of Satisfaction for environment in field of importing scrap to make production material; (ii) Organizations, individuals receiving goods on E-Manifest must obtain Certificate of Deposit to imported scrap for the scrap declared on E-Manifest as regulated at point b clause 3 Article 57 of Decree 40/2019/ND-CP.
Custom agencies are liable for inspecting the aforesaid conditions before allowing the discharge.

[15] Conditions for organizations and individuals importing scrap materials:

- Satisfying requirements on liability for environment protection regulated at Clause 2 and Clause 3 Article 76 of Environment protection law;
- Accomplishing report on environment impact approved by Ministry of Natural Sources and Environment which contains declaration of using imported scrap to make production material; being granted with certificate of environment protection work completion or toxic waste license which contains declaration of using scrap to make production material for projects having come into operation.
- Newly-built projects should meet requirement regulated at Article 16b and Article 17 of Decree No. 18/2015/ND-CP
- Obtaining Certificate of Qualification on environment protection in field of importing scrap to make production material in compliance with applicable law.

[16] It sets the target to 2025 to achieve the domestic recovery rate of 65%. By 2025, there is no license and gradually eliminating outdated paper and pulp factories with a scale of less than 10,000 tons/year.

- Strategy on Cleaner Production in Industry toward 2020 (issued by the Prime Minister's Decision No. 1419/QD-TTg on 07/9/2009)
- National Strategy on Green Growth[17] (issued by the Prime Minister's Decision No.393/QD-TTg on 25/9/2012)
- National Action Plan for implementing the Agenda 2030 for Sustainable Development (issued by the Prime Minister's Decision No. 622/QD-TTg on 10/5/2017)
- National Action Plan on Sustainable Consumption and Production by 2020 with the vision towards 2030 (issued by the Prime Minister's Decision No.76/QD-TTg on 11/01/2016)
- Government's Decree No. 68/2017/NĐ-CP issued on May 25, 2017 on management and development of industrial clusters
- National Plan for implementing Stockholm Convention on persistent organic pollutants (issued by the Prime Minister's Decision No. 1598/QD-TTg on 17/10/2017)
- Vietnam's Sustainable Development Strategy for the period of 2011-2020 (issued by the Prime Minister's Decision No.432/QD-TTg on 12/4/2012)
- Laws on Environmental Protection Tax since 2012 regulated the non-environmental friendly plastic bags (Polyethylene) are subjected to charge environmental protection fee
- The Decree No.155/2016/ND-CP from November 18, 2016 on punishment in environmental protection
- Document No.8170/BTC-CST issued on Jun 15, 2016 by the Ministry of Finance regulates on the import and export tax exemption for recycled plastics from hazardous wastes.

[17] The strategy encourages and supports communities to develop model of ecological urban center, green countryside, green house model, waste material sorting model at source by the method of reduction - recycling - re-using (3R) to improve the energy using efficiency. It also aims at boosting activities of recycling and reusing domestic waste materials including: (i) Developing and issuing Recycling Law, regarding domestic waste materials as natural resources aiming to minimize the amount of waste materials to be treated by burying; (ii) Developing modern recycling industry to be friendly with environment, studying to include this sector in the environmental planning industry; (iii) Applying technology of classification and recycling of waste garbage at urban centers and new industrial parks into energy, constructional materials and fertilizer and (iv) Technically and financially supporting to modernize recycling activities in the handicraft villages. By 2020, removing the technology that is old, obsolete and harmful to workers' health and causes environmental pollution in the recycling handicraft villages.

## 3.4. Annex 4. Background

### 3.4.1. Vietnam Economy

The Socialist Republic of Vietnam lies at the crossroads of two major biogeographic realms: the Palearctic realm's Himalayan and Chinese sub-regions and the Indo-Malayan realm's Sudanic sub-region. The country extends over 1,650 km from north to south between 23°30'N and 8°30'N covering a total area of 329,314 km2, with a maximum width of approximately 600 km and a minimum width of little more than 50 km. The country shares its border with China to the north, Laos to the northwest, Cambodia to the southwest and the East Sea to the east. Three quarters of the country is hilly or mountainous, while its lowland areas include two major river deltas: the Red River in the north and the Mekong River in the south. A narrow coastal plain runs along much of the country's 3,260 km coastline. With a population of more than 90 million, 65% of who live in a predominantly rural agrarian society (GSO, 2017), Vietnam is one of the most densely populated agriculture based countries in the world.

Vietnam has been undergoing a series of political and economic reforms to move towards a more market-based economy since 1986. Vietnam has transformed itself from an agro-based, poor country that was isolated internationally to an industrial economy dominated by state owned enterprises (SOEs) and collectives to what is now a globally integrated country fueled by foreign direct investment (FDI) and private investment.

The Vietnamese economy grew rapidly at an average rate of 7.6% from 1991-2010 and 6% during the period of 2010-2018. This growth has continued to date and it has greatly elevated Vietnam's international standing from its former placing in 1990 when the country was amongst the world's poorest with a GDP per capita of US$98 (ADB 2008). Rapid economic growth has resulted in Viet Nam transitioning to a lower middle-income country (as defined by the World Bank) with a per capita GDP of US$2,052 in 2014[18]. The country has made significant progress on human development indicators, particularly on education, health and living standards, as reflected in the steady increase of its human development index (HDI) over the last decade.

From a once-closed economy, Vietnam now trades with over 100 countries. Vietnam's accession into Asia Pacific Economic Cooperation (APEC), Associations of Southeast Asian Nations (ASEAN), ASEAN Free Trade Area (AFTA), and especially the World Trade Organization (WTO) in 2006 marked its integration into the world economy.

[18] Source: http://data.worldbank.org/indicator/NY.GDP.PCAP.CD

### 3.4.2. Plastic sector in the world

The plastic sector is a rapidly growing one worldwide to meet the demand. According to world plastic report, the average global consumption of plastic is at 45 kg/person/year with annual growth rate of 4% during the period of 2005-2015. Current plastic consumption is predicted to grow by 4-5% per year in the coming period (2016-2020). With a population of 4.3 billion people (60% of the world population), Asia is believed to be the main driver of worldwide plastics growth in the near future, where China, India and Southeast Asia are the world's targeted markets. With plastic usage per capita of 36 kg/year, lower than global indicator of 45 kg/year, Asia promises numerous enlargement places for the plastics industry.