

## WASTE TRADE AND EXTERNAL COST OF PLASTIC WASTES

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### Abstract

With the 1980s, global waste started to have a significant role in trade. One of these waste groups is plastics. Due to reasons such as urbanization, population and development, plastic production and thus plastic waste has increased. Due to external costs such as diseases caused by plastic wastes, environmental pollution and toxic gases, developed countries apply serious sanctions. This situation led the firms, which aim to avoid high costs caused by the sanctions, to export waste to underdeveloped or developing countries where there are no regulations or controls are lower. Decisions taken by countries in waste trade also affect the trade structure. This effect was realized with the ban imposed on China's import of waste and currently Turkey, which already shows increasing trend in foreign trade and a high dependency ratio, has accelerated imports of plastic waste. Recycling rate of Turkey is so low that this situation leads to cost the country both economically and socially.

**Keywords:** Waste Trade, Plastic, Environment, Health, Externalities.

**JEL Code:** H23, H41, Q53

### 1. Introduction

Globalization, urbanization, development and the increase in population have caused waste problems around the world. In general terms plastics, which are not classified as hazardous waste, occupy an important place when waste production is examined. Plastic wastes cause public health get worsened, environmental pollution and climate change during their decay due to various substances they contain. From a human viewpoint, it causes serious diseases such as cancer, skin diseases, obesity; in terms of environmental pollution, it threatens the lives of marine and land animals; it causes climate change due to the toxic gases produced during decay. Plastic will be the type of waste dealt with in the study due to the external costs. In this context, the concept of waste, classification of wastes and waste trade will be examined in terms of plastics Last part of the study deals with the non-pricing costs caused by plastic wastes; the general state of the world and finally the plastic waste trade in Turkey will be discussed. In line with this study, by taking into consideration the damage of plastic waste, aimed to examine the situation in Turkey's plastic waste trade.

### 2. Wastes In Production And Trade

There are multiple views on defining the concept of waste. One of the most agreed upon definition includes substances that became malfunction because of breaking, tearing or deterioration (Read, 1999: 18).

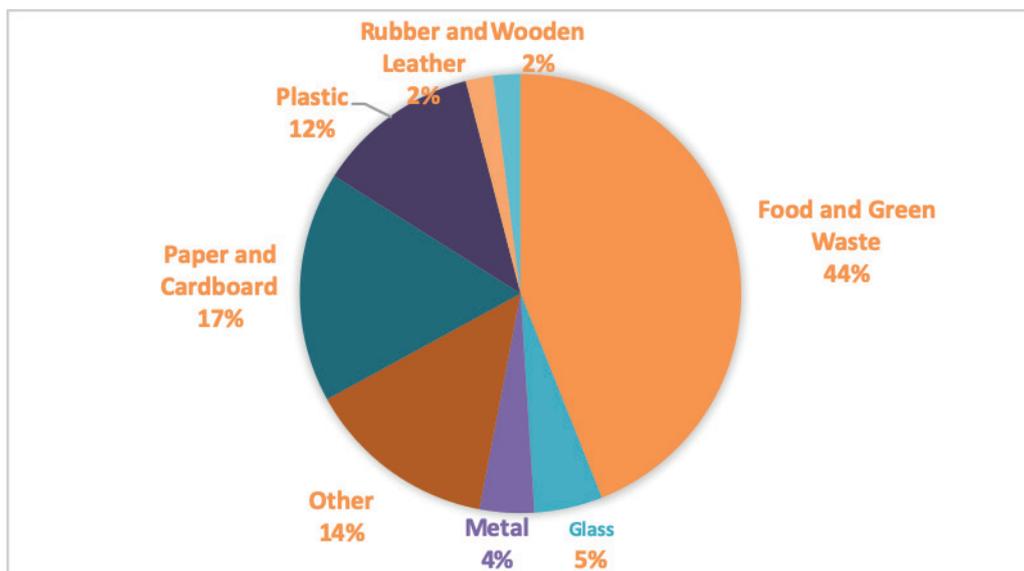
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Although wastes are classified according to a number of criteria, there is no classification mechanism based on international standards other than the European Union (EU) and this mechanism is left to the countries' own initiative.

Waste materials emerge in both production and consumption processes, and thus, they find a wide range from industrial activities to housing activities. The waste lists used by countries and international organizations for waste statistics are generally based on the process of production and the material content of waste or a combination of the two. Large waste categories frequently used in waste statistics such as industrial and hazardous wastes combine many different waste materials into categories according to their similarity to collection, treatment and disposal (UNECE; The Netherlands, 2016: 6). During the classification, characteristics such as production, consumption, chemical, physical, hazard size are taken into consideration. Accordingly, the wastes are divided into groups like solid, liquid, gas; harmful, harmless; medical waste. When waste is taken as an urban solid waste, at the international level, the largest waste category is food and green waste with 44%, followed recyclable wastes such as plastic, paper, metal and glass with %38 (See Figure 1).

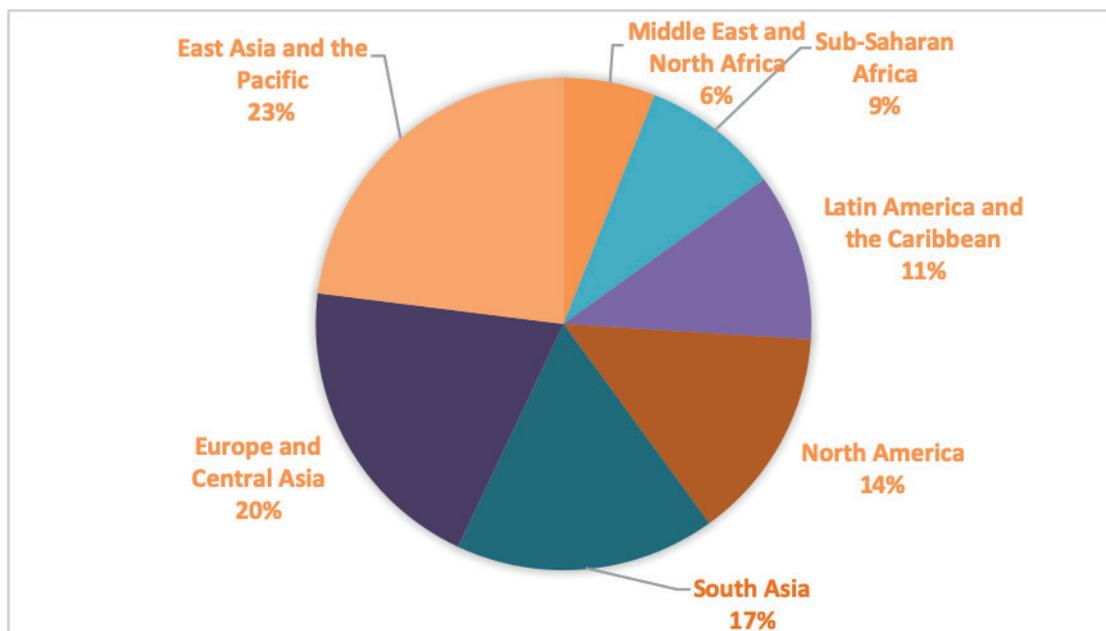
**Figure 1. Global Solid Waste Composition (% , 2018)**



Source: (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018: 29).

When the distribution of waste produced around the world taken into consideration , it is seen that East Asia and Pacific (23%) and Europe and Central Asia (20%) are the most waste producing regions (See Figure 2).

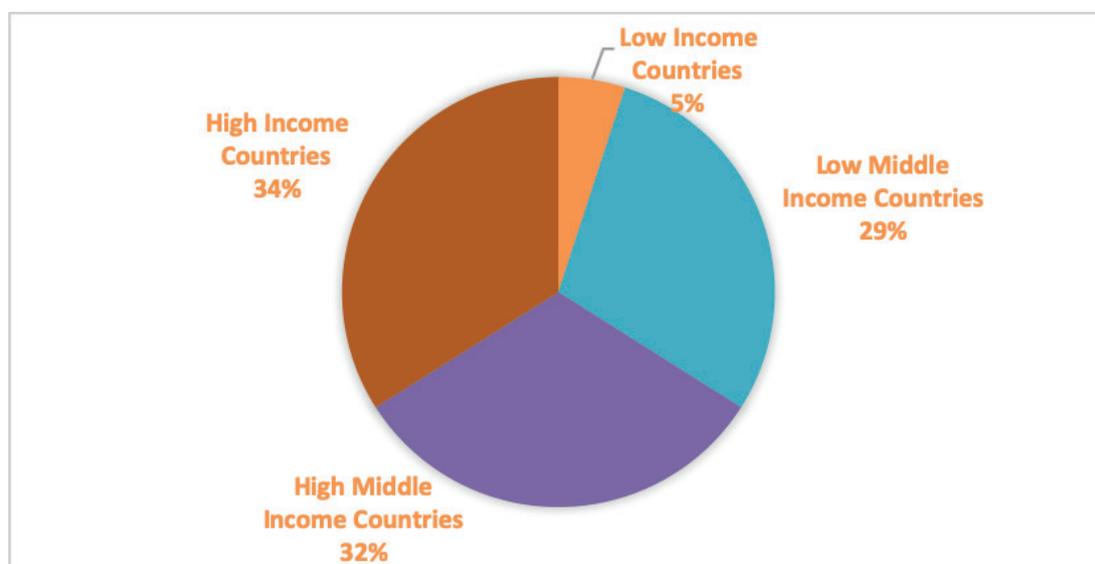
**Figure 2. Regional Distribution of Waste Production (% , 2016)**



Source: (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018: 19).

When a distinction is made with respect to income level through worldwide, it is seen that high-income countries constitute 34% of total waste and 5% of low-income countries (See Figure 3).

**Figure 3. Waste Production by Revenue Level (% , 2016)**



Source: (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018: 21).

One of the groups of commodities traded for countries after the 1980s was wastes. There are three main reasons why waste is subject to international trade. The first one is the significant increase in waste generation, particularly appeared with urbanization, economic development and population growth. In 2012, worldwide production of waste was estimated around 1.3

billion tons. According to the latest available data, global waste production in 2016 is predicted to reach 2.01 billion tons (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018: 18). The second case, which causes waste trade, is the idea of “not in my backyard” thought, and in particular, low-income countries do not have strong regulations in waste management (Strohm, 1993: 129).

### **3. Plastics in Waste Trade**

Plastic in the world has wide range of utilization opportunities, therefore it became a commodity that has penetrated into daily life in individual use. While the production level was 2 million metric tons in 1950, this figure was 380 million in 2015 and it left behind other materials (Brooks, Wang, & Jambeck, 2018: 1). If the trend continues in this way, expected amount will be 33 billion tons in 2050 (Rochman & Browne, 2013: 171).

This increase in the production of plastics has brought plastic waste trade with it. In developed countries, sanctions such as taxes or penalties imposed with the aim of preventing negative externalities, such as destruction of environment and worsening public health, lead waste producers to export wastes who do not want to bear the costs of these. A firm that works under strict competition, maximizes its profit when the market price is equal to marginal costs. In this case, the company determines the amount of goods to be produced according to the market price. The company, which takes the market price as data and aims to maximize the profit, creates waste that pollutes the environment while performing production (Akkaya, 2018: 34). In order to eliminate this negative externality, the public administration imposes sanctions on waste like taxes, deterrence penalties, etc. Companies that do not want to bear this type of cost tend to export waste, which they find less costly. In addition to this, there is an increase in plastic wastes due to urbanization and economic development as well as consumption. According to a study conducted in 2018, it is concluded that the goods consumed in high-income countries contain more plastic materials than low-income countries (Kaza et al., 2018: 29).

As far as developing or underdeveloped countries are concerned, importing waste provides a cost advantage in some sectors. Plastic as a petrochemical product can be recycled to a raw material and that motivates developing countries to the plastic waste trade. This situation, which creates a cost advantage in terms of developing countries, brings with it costs that cannot be priced and can cause serious consequences both for the society and the environment.

#### **3.1. External Costs Caused By Plastic Wastes**

Whether the plastic wastes should be classified as hazardous waste has been discussed in the literature. The common opinion that the plastic waste should be classified as hazardous waste is based on the fact that these wastes are both public and local bad goods at the local and global levels. The reasons behind this are the harmful substances that occur during recycling, the negative effects of plastics on public health, the negative effects on the environment and climate change.

It is seen that the materials such as Polyethylene (PE), Polypropylene (PP) and Polyvinyl Chloride (PVC) which are frequently used in our daily life, have a negative impact on human health in a wide range such as cancer, obesity, respiratory system diseases, diabetes, skin diseases, birth defects (Proshad et al., 2018: 3).

Plastic wastes not only threaten human health, but also harm nature. Studies have shown that more than 260 species, including invertebrates, turtles, fish, seabirds and mammals, have reduced their movement and nutrition due to swallowing or exposure of plastic debris, resulting in a reduction in fertility or death (Thompson et al., 2009: 2155).

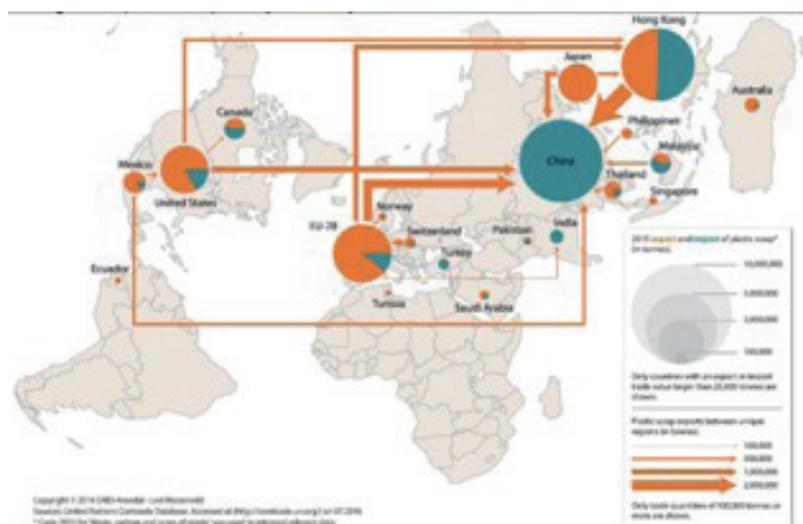
Another important problem caused by plastic wastes is the release of gases that cause climate change during the degradation process. According to a study published in 2018, plastic such as pet bottles produced two greenhouse gases known as methane and ethylene when exposed to sunlight; it was concluded that plastics exposed to air emitted more methane than those exposed to sea water (Royer et al., 2018).

### 3.2. Plastic Waste Trade in the World and Turkey

The guidelines and rules on cross-border movement and the healthy management of hazardous wastes by regulating waste trade at an international level are set out in the Basel Convention, which was implemented in 1992 by the United Nations. Basel Convention aimed the reduction of hazardous waste generation and promotion of environment-friendly management of hazardous wastes in places where there is no disposal site; limitation of cross-border movements of hazardous wastes, except where it is perceived in accordance with environmentally management principles; a regulation for situations where transboundary movements are permitted (UNEP; SBC, 2011).

Imports and exports of plastic waste have increased rapidly since 1993. The largest exporters of plastics waste in the world in 2017 were the United States (12%), Japan (11%), Hong Kong (9.3%), Germany (8.1%), Belgium-Luxembourg (4.3%). On the other hand China (47%), Hong Kong (11%), the United States (4.2%), Vietnam (3.4%) and the Netherlands (3.2%) were the countries that received the most of the imports.

**Figure 4. Import and Export of Plastic in the World (2015)**

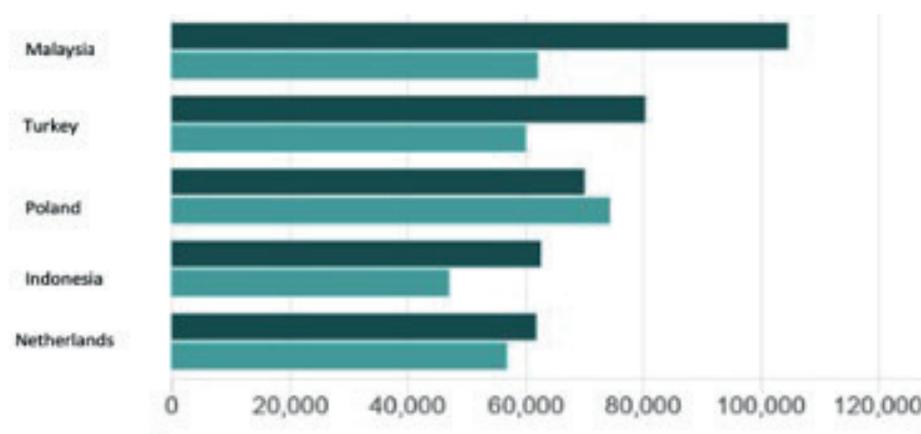


Source: (GRID-Arendal, 2017).

Almost half of the plastic wastes (14.1 million MT) planned to be recycled in 2016 were exported by 123 countries and a significant amount of these (7.35 million MT) were imported by China (Brooks et al., 2018: 2). Figure 5 shows the import and export of plastic waste globally in 2015. As can be seen from the figure, China was dominant in the import of plastic waste until 2018, but with the prohibition, these banned wastes directed to new countries.

As an example, that a significant portion of the pre-plastic waste export ban to China, Britain has increased exports to Malaysia, Turkey, Indonesia and the Netherlands (See. Figure 5).

**Figure 5. Change in the Amount of Exports of Plastic Waste in the UK  
 (■ 2017-2018, ■ 2016-2017, Ton)**



Source: (Harrabin & Edgington, 2019).

Another country that makes a significant portion of China’s plastic waste import was the United States. This situation has changed after the ban and in 2018, the rate of US plastic waste exports to China decreased by 92% and exports to Malaysia increased by 273% (McVeigh, 2018). On the other hand, another remarkable point is that countries that exports plastic waste such as Malaysia and Thailand are going to apply preventive measures in this area like China (Lee, 2019).

An important issue to be addressed at this point is the process of recycling waste. Globally, approximately 37 percent of the waste is disposed in a landfill, 33 percent is discharged into open areas, 19 percent is recycled, and 11 percent is treated with a modern incineration. Adequate waste disposal or treatment using controlled landfill sites or more strictly operated facilities is almost the domain of high and upper-middle-income countries. Low-income countries often use open dumps. In low-income countries, while 93 percent of wastes discharged into open areas; this rate is only 2 percent in high-income countries.

When the plastic good production is examined in Turkey, packaging ranked first, followed in second place with white goods, building and construction as the third (PAGEV, 2017). On the other hand, waste production within the country does not meet the demand for raw materials and thus import is an important option.

Table 3 shows the percentage of external dependency of plastic raw materials in 2010-2016. Polyethylene (PE), Polypropylene (PP) and Polyvinyl Chloride (PVC) raw materials are considered and it is seen that foreign dependency ratio is 87.2% in 2016 (See Table 1).

**Table 1. Plastic Raw Material Outward Dependency Ratio (2010-2016, %)**

Plastic Raw Material Outward Dependency Ratio (%)							
Type / Year	2010	2011	2012	2013	2014	2015	2016
PE	71,5	75,1	77,0	80,3	80,1	80,5	81,1
PP	91,0	92,3	93,7	94,1	95,6	94,0	94,0
PVC	83,4	85,0	84,5	88,6	89,2	86,5	84,8
Total	81,3	83,7	85,2	87,3	88,1	87,2	87,2

Source: (İnkün & Portakal, 2016).

Trade policies applied on the plastic waste worldwide affects Turkey too. In particular, import bans imposed by China in 2018 resulted in an increase in Turkey's imports of plastic waste. For example, with the China's ban policy, amount of plastic waste Britain export to Turkey rose from 60,000 tons to around 80,000 tons (Harrabin & Edgington, 2019).

When considered in terms of recycling, while European Union average is 39%, Turkey's average recycling is just 1% (European Environment Agency, 2016). On the basis of Turkish Statistical Institute (TUIK) data, the rate of recycling of waste collected by municipality licensed facilities is 9.3% (TUIK, ty.).

External dependence and the low level of recycling rates in raw material production has a negative impact on the national economy and on public health, environmental pollution and climate change. In order to eliminate these negative effects, a sustainable production and recycling concept should be gained. With the legal regulations, the society should be made aware of results of plastic use. In this context, it is important to make cost-benefit analysis of plastic production, use and trade in order to eliminate the negative externalities in the long term.

#### 4. Conclusion

When the global plastic waste trade is analyzed, it is seen that developed countries play an important role in export-oriented, non-developed and developing countries. On the other hand, until 2018, China had a significant share in the import of plastic waste. In this context, Turkey is also observed an increase denominator received from the plastic waste imports. In order to prevent the external costs caused by plastic wastes, policies should be implemented to deter waste imports and support domestic recycling. In this context, incentive subsidies for waste management can be given within the country. In order to increase the level of recycling, the number of recycling facilities should be increased. Imports of plastic waste also negatively affect the internal demand to collect waste, so there should be protective policy which gives attention to employment in waste industry. In this context, supportive measures need to be taken. In order to avoid external costs caused by plastic wastes in the long term, the plastic consumption of individuals should also be reduced. Therefore, efforts should be made to raise the awareness of individuals, the deposit should be applied to support the separation of domestic wastes at home and the use of plastic should be avoided by taxes or additional pricing. In this respect, the pouch fee policy implemented in 2019 should be diversified.

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