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International Trade with Waste

Do developed countries use the third world as a garbage-can or can it be a possible win-win situation?

Abstract

In this thesis, trade with waste between developed countries and the third world will be presented to analyze whether waste-trading can create a possible win-win situation. To carry on this question problem, three theories have been considered to explain why and how developing countries can be affected by international waste-trade. A few case-studies regarding waste-trade in developing countries such as, India, China and Vietnam, will show the situation of waste-trade today. These theories and case-studies will set the foundation for analysis and conclusion. To sum up, trade with waste is a complex problem that can affect the importing country in both positive and negative ways. If the negative externality that is caused by handling waste is controlled with a tax or regulation, trade with waste can be a win-win situation for the trading countries.

Keywords: Waste, International Trade, Developing Countries.

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1. INTRODUCTION

Globalization today implies increased trade between countries and also many developing countries begin to join the world market. It is not only ordinary goods that are imported/exported, but also different kinds of waste are being traded. From harmless goods such as paper, suitable for recycling, to toxic waste dumped as landfill.

Figure 1 below shows a simplified model of the waste-trade between developed and third-world countries.

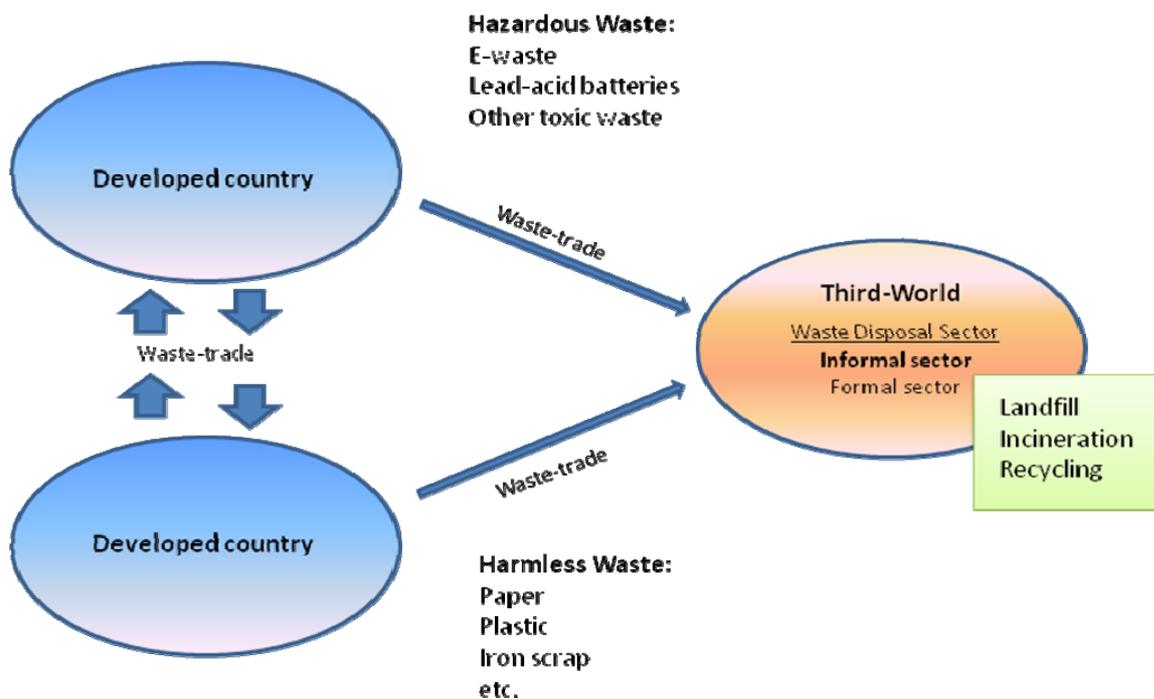


Figure 1. Flow of waste traded between developed countries and third-world.

Most of the world's trade with waste goes from one developed country to another. But a considerable amount of waste also goes from developed countries to countries in the third-world. There are three ways for the waste-importing country to deal with waste; landfill, incineration or recycling.

The picture media sends out regarding waste-trade is often a dramatic story about toxic waste being dumped in developing countries. For instance, one article in The Guardian (2005-03-28) revealed that 1,000 tons of contaminated household waste disguised as waste paper had been sent to China. This waste was meant to be sorted by hand by people working under dreadful conditions. Less often, media tells us stories about developing countries benefit from imported waste.

1.1 RESEARCH PROBLEM AND DISPOSITON

The purpose of this paper is to analyze whether waste-trading can be a good way to deal with waste. That is, if developed countries only use waste-trading as an easy way to dispose of their waste or if developing countries can benefit from waste-trade?

The paper begins with the chapter “*Waste trade in the world*” that describes the background. The next chapter “*Theory*” presents a few theories that will set the stage for analysis. Several theories in the area of international trade will be presented in order to explain why and how countries can be affected by international trade. Theories regarding the trade with waste will also be presented to explain how trade with waste can differ from trade with ordinary goods. The theoretical chapter is followed by an empirical chapter “*Case Studies*” describing the world-wide trade in waste through four case-studies. In this chapter I also describe the kinds of waste that currently are being traded.

To find out how trade with waste can affect developing countries and study how suitable developing countries are for the waste-import, I describe the waste disposal services in the above mentioned case-studies from developing countries.

In the final chapter “*Conclusion and Discussion*” I conclude by analyzing the case-study findings in relation to theory and by discussing alternative points of view on the subject and also by providing an example for further studies.

1.2 METHOD

Throughout this paper I have mainly used information and data from literature and articles, which I found through databases, internet, libraries and the Swedish Environmental Protection Agency (Naturvårdsverket).

During my research I have found that there is a dearth of theories specializing on the area of waste-trade. I chose to use the three theories I found that seemed most relevant for this paper.

I have also got a lot of inspiration and knowledge from spending one semester in Hoi An, Vietnam, studying International Development in 2007.

1.3 DELIMITATION

In this paper I will focus on trade with waste that involves developing countries, because developing countries often are more vulnerable both economically and environmentally.

2. WASTE TRADE IN THE WORLD

Importer and Exporter of Waste

Figure 2 below illustrates a bar chart of transboundary movements of waste in 2000. It shows that approximately 75 percent of the total volume of waste is traded between developed countries (i.e. OECD members).

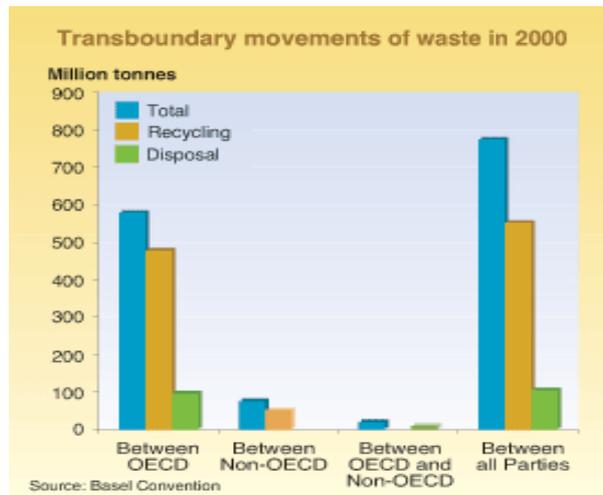


Figure 2. Transboundary movements of waste (UNEP).

For instance, during 2000, Germany was one of the top importers of waste, bringing in over 1 million tons of waste from 38 different countries. Most of the waste was imported from neighboring countries like the Netherlands, Luxemburg, Belgium and Italy (UNEP, Transport and Trade, 080408). The industry in Germany seems to specialize in processing waste disposal services. Trade with secondary materials (waste and end-of-life products) has recently begun to expand, from 4 million tons in 1993 to 16 million tons in 2001, shown in figure 3.

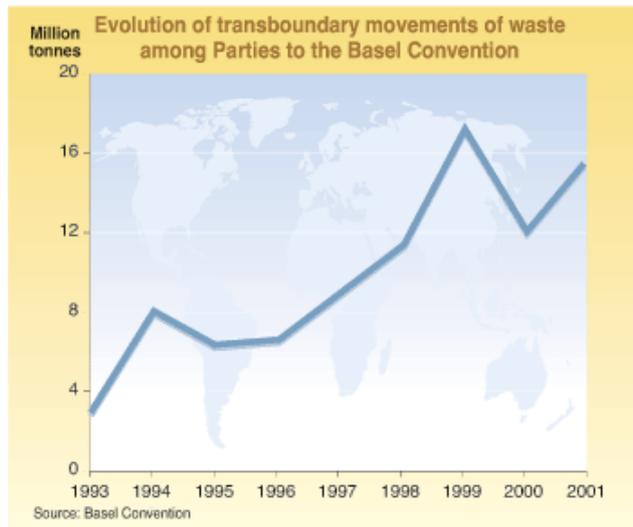


Figure 3. Evolution of transboundary movements of waste (UNEP).

But the world largest waste-importer is a developing country, China, which imported more than 4 billion tons of plastic, 12 billion tons of waste paper and over 10 billion tons of scrap iron and steel in 2004 (Moriguchi and Sakai, 2004).

What Kind of Waste is being traded?

In many household and production processes, unwanted by-products are generated and these can in themselves be tradable commodities, such as waste-paper, organic material, electronic waste and so on.

Generally waste can be divided into two different groups; harmless or hazardous. Example of harmless waste are waste-paper, PET bottles, iron-scrap. Hazardous waste is material that contains toxic substances. This kind of waste causes pollution that can harm the environment and human health. The pollution in this case can be defined as externalities, i.e. an extra cost for the waste-importing country. Hazardous electronic waste is continuously exported to China, Pakistan and India, primarily from North America. The waste contains toxic metals that are harmful for the people handling it and poison the surrounding environment (Kuhn and Cassing, 2003, p.496).

A case of trade with hazardous waste that caused negative externalities happened in 1986 when a British company established a large mercury-reprocessing plant in South Africa and

begun to import mercury waste. In 1988 the World Health Organization (WHO) discovered contents of mercury in a river 50 kms away from the plant, 1000 times higher than the WHO standards. Later on two workers died because of mercury poisoning and others became permanently disabled (Lipman 2002).

In the late 1980s, stricter environmental regulations dramatically increased the cost of hazardous waste disposal. In search for cheaper alternatives to get rid of the waste, industries in developed countries began shipping their hazardous waste to developing countries and to Eastern Europe. To prevent possible dumping of hazardous waste in the developing countries, the “Basel Convention on the Transboundary Movements of Hazardous Waste” was created to protect the developing countries. At first the Basel Convention meant to regulate the trade with hazardous waste but, nowadays, trade in hazardous waste is totally banned. Currently, approximately 170 countries have ratified the Convention (Basel Convention 2008-04-16). The main problem with the Convention is the lack of distinction between “waste” and “products” which gives the opportunity for trade in hazardous waste in the name of products.

On the other hand, several developing (and developed) countries have considerable recycling industries that are driven by imported waste, including hazardous waste. These imports of secondary-raw materials are important to those developing countries and they may experience serious consequences from the ban on trade with hazardous waste. Industries will be forced to close which will lead to increased unemployment and decreased living standards for the country’s population. One example of this is the import of lead-acid batteries into India and the Philippines, which are needed in their domestic industries such as batteries in motor vehicles, telecommunications, and computer equipments. One study has counted that 80 percent of the Philippines refined lead output comes from the secondary lead smelter (Lipman, 2002). The trade with waste therefore creates a trade-off between the gains from trade and the hazardousness to the environment and human health.

Waste Disposal Services in Developing Countries

When it comes to waste disposal there are three options to get rid of the waste; landfilling, incineration or recycling. Landfilling is the cheapest alternative but it can become

problematic in terms of shortage of land and pollution/hazardous waste spreading from the dumpsites.

Incineration is not really suitable for developing countries since their waste often contains a high level of organic material (Nas and Jaffe, 2004, p. 344). The most environmentally friendly and cost-effective alternative of waste disposal is recycling and, in this field, the informal sector plays an important role in the developing countries' waste disposal services.

Urban areas in developing countries often consist of both formal and informal waste disposal sectors. The formal sector consists of municipal agencies or private firms responsible for the waste collecting, transport and disposal. The informal sectors consist of individuals, families, groups or small enterprises that are making their living through collecting, sorting and selling the collected material on the market. This market is unregulated and the actors on the market such as waste-pickers, itinerant buyers, small scrap dealers and wholesalers are unregistered and do not pay taxes. These activities/individuals are mainly driven by the market forces. The individuals in the informal sector are often among the poorest and most exposed in a society. In India, for example, many individuals are born to work in the waste disposal sector.

The informal waste disposal sector is labor intensive and can, therefore, create work opportunities, especially for marginalized individuals. The informal sector also generates values in the forms of positive externalities. When the waste is being collected, sorted and sold, there is a positive effect of this in the increased availability of natural resources that supply raw material to the industries (Medina 1997). Another positive effect is created when the alternative to recycling is land-filling and the informal sector extends the life time for these land-filling sites. And, of course, the waste pickers are keeping the cities clean from waste. In spite of the importance of the informal sector, it is often ignored when policies that affect the waste disposal sector are being formulated. To replace this system with a Western collection system can have devastating consequences and is a classical example of an attempt to intervene without having full knowledge about domestic traditions, informal sector and market forces (van Beukering and Sharma, 1996). Third-world countries have different physical and socioeconomic conditions than developed countries and, therefore, require different solutions. An example of advanced Western technology transferred to developing countries is the expensive incinerators that have been built in cities such as Manila, Mexico City, Lagos, and Istanbul. These incinerators have not operated as expected and some of them were never even used (Medina 1997).

3. THEORY

This chapter will present three different theories regarding international trade with waste. The three theories explain waste-trade from slightly different points of view. All three theories explain the cause of trade with waste and how the importing and exporting countries can be affected by the trade.

This will set the stage for analyzing the case-studies that will be presented in chapter 3. The first theory is closely related to the traditional trade theories concerning comparative advantages, but here the tradable goods are causing a negative externality. The second theory presents the relationship between changes in cost of transportation, prices of land and trade with waste. The third theory implies that trade with waste can be caused by differences in pollution regulations between countries.

3.1 INTERNATIONAL TRADE WITH WASTE – WHEN WASTE IS HARMLESS OR HAZARDOUS

Basic models of international trade do not include negative externalities, such as pollution or toxic substances, that possibly arise if the tradable goods are waste. That is why a few new theories have emerged in the area of international trade with waste.

Copeland (1989) has developed a model of international trade in waste disposal services and he investigates the welfare effects of restricting such trade. Since waste disposal generates negative externalities there will be an international transfer of negative externalities, when waste move from one country to another. This model includes the problem of negative externalities and also the presence of illegal waste disposal. In the model, a small open economy is considered with the production factors land, labor and waste. Production of good X is a function of the production factors, so that $X=f(\text{land}, \text{labor}, \text{waste})$ The waste is a by-product of producing good X.

The model explains a pattern of trade that depends on the relative factor intensities and factor abundance similar to the Heckscher-Ohlin's factor-proportions theory that gives the causes for comparative advantages (Krugman, 2007, p. 63). If we considered a harmless sort of waste like waste-paper we do not include negative externalities from waste and we assume that the waste disposal service is land intensive relative to producing good X. Then if one country has an abundance of land relative another country, the land-endowed country has a comparative advantage in waste disposal and will, therefore, process both foreign and domestic waste material in a world with free trade (Copeland 1989). In other words, a country should specialize in production of goods or services they can do effectively and export those goods or services. (In normal circumstances, services can be difficult to export). Then they should import goods other countries can produce more effectively. Both importing and exporting countries will be better off with free trade than without.

A waste disposal service can cause negative externalities, for instance, when a waste-importing country uses the waste as landfill and toxic substances leak into a nearby river. In this case a free market will cause overproduction in waste disposal services, because the externality cost will not be included in the cost of production. Figure 4 shows that the quantity produced without regarding the external cost will be Q_0 , and if we consider the external cost in the graph, the supply curve will be pushed upwards and the optimal produced quantity will decrease to Q_1 . The initial supply curve represents the private marginal cost, so together with the external cost it will represent the marginal social cost. However, without counting for the external cost, free market will cause an overproduction in waste disposal services ($Q_0 - Q_1$).

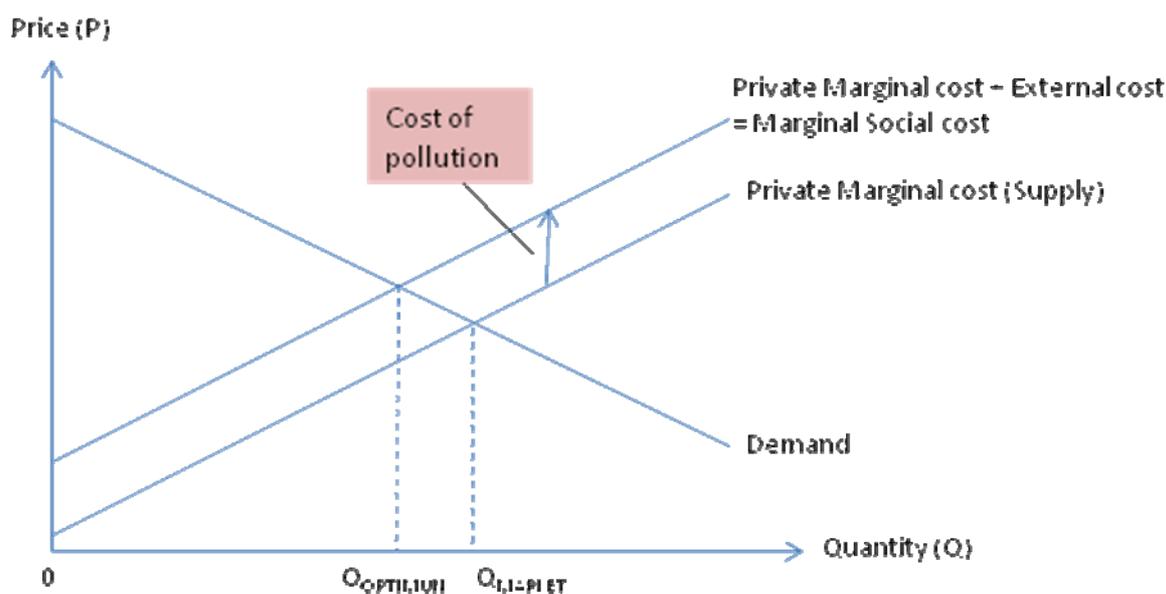


Figure 4. Negative externality (Mankiw and Taylor 2006)

To reduce production to the optimal level, an intervention, like a tax on the output of the waste disposal sector, needs to be implemented to reach the optimal level of production. The tax will be set with the purpose to reduce the return to the waste disposal industry by an amount equal to the marginal damage imposed on consumers.

The first-best policy is to implement a regulation or taxation in the waste disposal sector to control for the negative externality. In practice, individuals and firms face strong incentives to avoid taxes and regulations and dispose of their waste illegally. Especially if the taxation or regulation system is complicated and illegal disposal is cheaper. The government designs regulation in the waste disposal sector to minimize environmental damage but this may be ignored by the firms and individuals. Another problem regarding taxes and regulation on waste disposal services is that governments do not adequately regulate and do not have the ability, or the political will, to implement an optimal tax in waste disposal sector. In the above cases, a restriction on import of foreign trade at the border is the second-best policy and will therefore be welfare improving (Copeland, 1989).

3.2 COST OF TRANSPORTATION, LAND PRICES AND WASTE-TRADE

Another explanation to the increased waste-trade can be made by a model that compares the transport cost and land cost to find the optimal distance to landfill. Almost all waste is transported somewhere to get rid of, if it is not being recycled and used again. A long time ago it would have been enough to just throw the waste over the city wall, since a further transport of the waste would be too costly. Today the amount of garbage has grown in most countries, especially in developed countries, and it is not possible to throw the garbage over the city wall. Figure 5 shows the relationship between the transport cost and the land cost and the optimal distance to the landfill. The vertical axis represents the waste disposal cost and the horizontal axis represents the distance to landfill. The transportation cost curve shows that transportation cost increases with longer transports. The cost of land curve has got a negative slope showing that the cost of land will decrease further away from where it was generated, which is usually highly populated cities. When summing up the costs of both transport and land we get the total cost of landfilling waste. This cost is represented by the u-shaped curve in figure 5. The optimal distance to landfill will be at the point where the total cost per ton of waste is minimized (D_{OPT}) in figure 5 (Porter 2002).

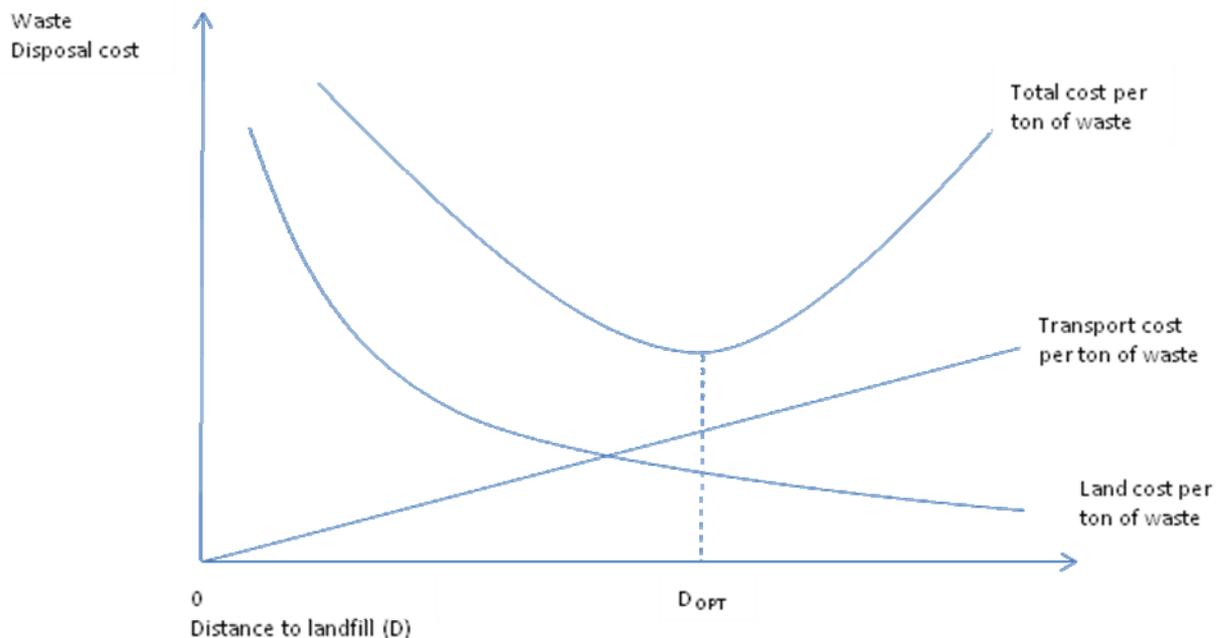


Figure 5. Optimal Distance to a Landfill (Porter 2002)

Anything that increases the cost of land, or decreases the cost of transport, will push the optimal distance to landfill further away. If we look at the history of transportation we can see that the costs have decreased with the higher level of international trade. At the same time the price of land has risen. If we consider falling transportation costs, together with rising land prices, the distance to the landfill will increase and waste might even be transported out of the country.

It seems as if waste export can be a good economic solution for the exporting country to dispose their waste in a different country at a lower price. But what about the waste-importing country? Who gains and who loses when the transport costs become low enough to export the waste to another country with lower landfill cost?

This question can be answered by a simple illustration of market with price of landfill (P) and the quantity of waste produced by year (Q) (figure 6), this market is driven by the local supply of landfill space (S) and the demand for landfill space (D). Without waste-trade the price of landfill will be P_0 and quantity of waste will be at Q_0 . But if the transport cost goes down so that distance to landfill offers a lower price (including transport cost), see P_1 in figure 6, the quantity of waste generated will increase (Q_1), but the quantity of waste landfilled in the local area will decrease by $Q_1 - Q_2$, this amount of waste will be exported. The local landfill owner in the waste-exporting country will lose rents equally to the area α , but local businesses and households will gain consumer surplus equal to the larger area ($\alpha + \beta + \gamma$).

In the situation above, it could be proved that the exporting countries gain when trade with waste is introduced. Moreover, it could seem as if one country gains and the other loses, but this is not the case. It can also be proved that even the waste-importing country gains with the open trade. Figure 7 is similar to figure 6, showing local supply curve of landfill space (S), and the local demand curve for landfill (D), without waste-trade the price of landfill will be P_0 and quantity waste generated Q_0 . If trade begins (caused by a fall in transport cost), new demands from other countries will appear and push the price of local landfill up to P_1 . The total waste increase to Q_1 but the local waste will decrease to Q_2 , meaning that local business and household will loose consumer surplus equal to area ($\alpha + \beta$). The waste $Q_1 - Q_2$ being imported and therefore will the local landfill owner gain the larger area ($\alpha + \beta + \gamma$).

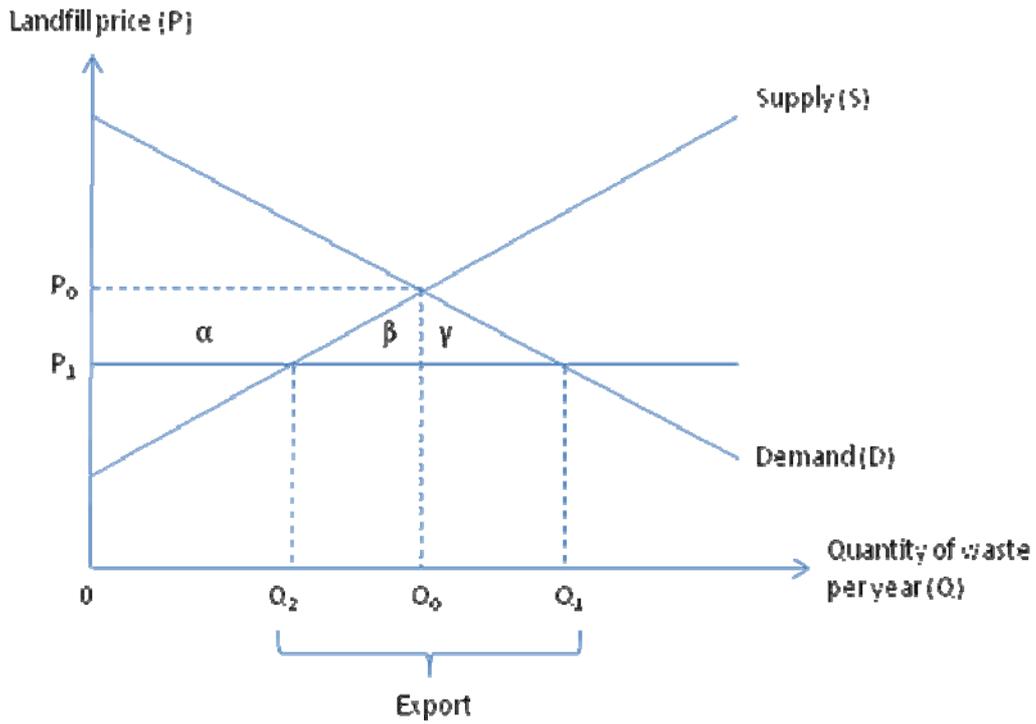


Figure 6. Gains and Losses from Exporting Waste (Porter 2002)

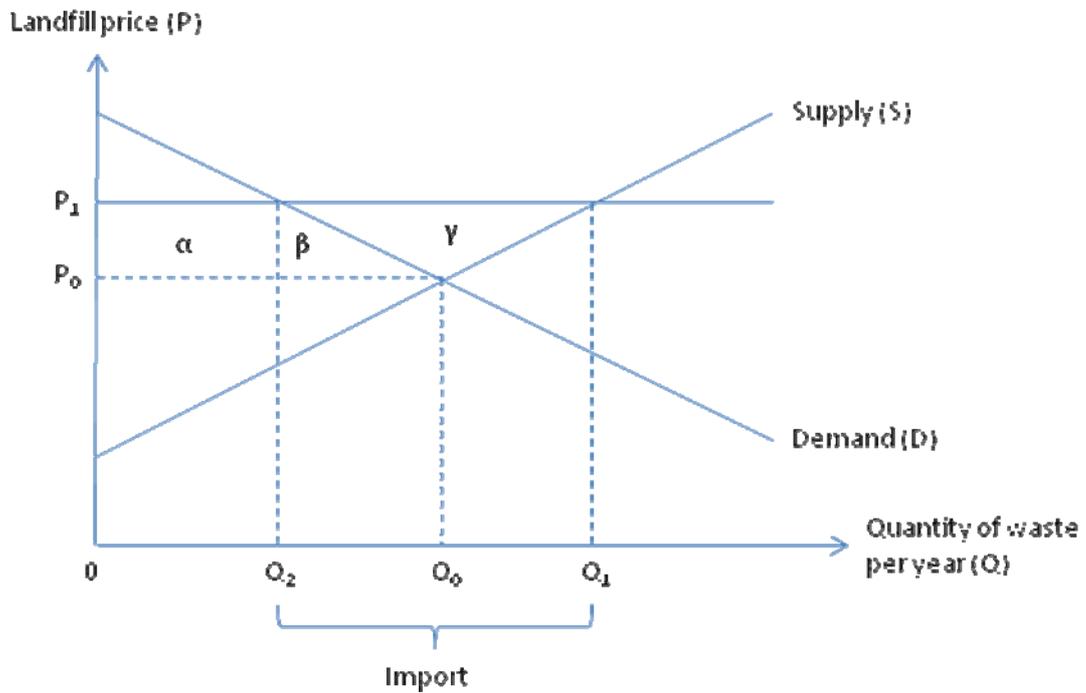


Figure 7. Gains and Losses from Importing Waste (Porter 2002)

The theory shows that both the exporting and importing countries gain from waste trade. But some things are missing in the model. First, the waste can cause a negative externality for the importing country and will cause the quantity of domestic waste generated to exceed the optimal level. To deal with that problem taxation on domestic waste is a solution, but not a tax on the import of waste. Second, when the price on landfill decreases, the incentives for recycling decrease, because recycling is the most effective and environmental friendly way to dispose of waste, some people are against waste trade (Porter 2002, p. 105).

3.3 DIFFERENCES IN POLLUTION-REGULATIONS BETWEEN COUNTRIES

This theory is based on the “pollution haven” models. A pollution haven is defined as a region, or a country, with a concentration of pollution-intensive activities and a pollution-policy that is weaker relative to its trading partners. Another assumption in the pollution haven models is that differences in regulations arise from inequality of the world distribution of incomes because environmental protection is a normal good. A normal good in economics is defined as a good that will be positively affected when income increases. The opposite is called an inferior good, when income level raises the demand for the good will decrease. However, this means that a country with a relative low income level will demand less environmental protection than a country with higher income level.

In many cases the traded waste generates some kind of negative externalities for the waste-importing country and, to compensate for these, an intervention is often considered. The literature describes the policy problem from different angles. One angle assumes that the differences in pollution regulations are a key determinant of the production costs and, therefore, for industry location, meaning that it could be effective to send hazardous waste to countries with lower regulation on environmental damages. In other words, trade with waste is driven by the countries differences in pollution-policies (Copeland and Taylor 2003, p. 143-144). A second angle concerning waste-trade is that, in the case of free-trade, the waste-importing country can correct the externality with domestic regulations or taxes. This idea is called “first-best policy”. But if the country is unwilling to set domestic regulations or taxes, a restriction on foreign trade with waste can be implemented to reduce the amount of waste import (Copeland 1989).

4. CASE STUDIES

In this chapter, a few case studies from different developing countries will be presented to describe developing countries as waste-importers. This chapter will also show how the waste disposal sector can look like in third-world countries.

The three countries that are presented in the case-studies are chosen because of the information and data that were possible to collect about those countries. The dearths of information/data about the subject made me choose those developing countries I could find most relevant information about.

The three theories described in above chapter are meant to be plausible on every case-study.

4.1 CHINA – THE WORLD’S BIGGEST WASTE IMPORTER

E-waste

Trade with secondary materials (waste and end-of-life products) has recently begun to expand. China is the world’s biggest importer of waste and secondary materials, importing more than 4 billion tons of plastic, 12 billion tons of waste paper and over 10 billion tons of scrap iron and steel in 2004 (Moriguchi and Sakai, 2004). Among the countries that export waste to China is Japan and the USA. A hundred tons of “e-waste”, like computers and televisions are created annually in USA and a huge amount of this waste is exported to developing Asian countries. Most of it ends up at family recycling workshop (Worldwatch 2008-05-20). Reasons for the increased export of e-waste from the US are at least twofold; the huge amount of e-waste that is currently created every year and the high costs of recycling. For instance, to recycle a monitor in the United States can cost up to \$15 (Schmidt, 2006). Another study presents disposal costs for hazardous waste. The estimated disposal cost for a developing country ranged between US\$2.50 to US\$50 per ton compared with the cost of US\$100 to US\$2,000 per ton in OECD countries in 1988 (Lipman 2002).

China is not the only importer of the US e-waste. A recently discussed topic is the increasing amounts of e-waste traded to poor countries in Africa. An article argues that 75 percent of the electronics shipped to Africa is irreparable junk, and most of it ends up in landfills and

informal dumps. This e-waste contains toxic materials that are poisoning the nearby area (Schmidt, 2006). Another interesting point in the same article is presented like “in Asia, the buyers tend to know more about the material than the sellers. But in Africa, it’s the other way around” (Schmidt, 2006, p.235).

Plastic-waste

Another kind of waste that is commonly traded is plastic. In 2001, China imported 2225 thousand tons of plastic, most of it from Hong Kong followed by Japan and the USA (Moriguchi and Sakai, 2004, p. 87). Parts of this plastic waste was PET bottles. In Japan, for instance, the law of Containers and Packaging Recycling obliges the recycling companies to process the PET waste into plastic flakes or pellets for further use, such as textiles. However, the production of textiles out of recycled plastic is generally expensive in Japan compared to in China. That’s why traders buy this plastic waste and export it to China where the manufactures produce recycled polyester fibers and other textile products by using low-cost labor (Moriguchi and Sakai, 2004, p.91). Since PET bottles are not valuable in Japan the law was meant to increase the valuation by converting the PET bottles into flakes and pellets. The cost of collection and transportation should be paid by the municipalities in Japan, and the cost of recycling by the recycling factories. Since the increased costs of handling the PET waste, some recyclers have begun to export PET flakes and pellets. Even a few municipalities in Japan have begun to directly export collected bottles, regardless of the law. However, some of these textiles made by the PET waste in China are re-exported to Japan and form a recycling loop between Japan and China (Moriguchi and Sakai, 2004, p.92).

4.2 INDIA, CASE OF WASTE PAPER AND SHIP-SCRAPPING

One kind of waste that is being traded world wide is waste paper. It is found that developing countries are net importers of waste paper and developed countries are net exporters. During the last two decades a substantial increase in the volume of traded waste paper has been noticed (van Beukering and Sharma, 1996). What kind of impact does this importer-exporter relationship have on a developing country?

India was in 1993 ranked as the 17th largest producer of pulp and the 20th largest producer of paper in the world. The consumption of paper in India is still low, but the rapid urbanization and industrial development is expected to increase the consumption of paper and paper products (van Beukering and Sharma, 1996).

India is a net importer of waste paper, because the country is effective in the utilization of waste paper (van Beukering and Bouman, 2003). One explanation why developing countries have got such a high utilization rate of waste paper is that many developing countries have tropic forest endowments unsuitable for pulp production. Because of the low content of wooden fibers, recycling of waste paper is an alternative (van Beukering and Bouman, 2003). The utilization rate of imported waste paper is higher than the use of domestically produced pulp, since the longer fibers in the recycled paper results in higher quality paper.

The share of paper with a base of wood pulp declined from 65 percent in 1985 to 49 percent in 1992. At the same time, the share of waste paper based paper rose from 13 percent to 22 percent. This change, to use more waste paper than wood pulp in the Indian paper production has had positive impacts on the environment in the forms of decreased water consumption and solid waste generated. Furthermore, in most of the waste paper mills the energy consumption is 3-4 times less (van Beukering and Sharma, 1996).

Van Beukering and Sharma (1996) developed a simulated model of a waste paper cycle in Mumbai which contains both a formal and an informal sector. Two policy options were considered, the encouragement of the existing informal recycling sector and the introduction of a western style recycling system. Extrapolation of four types of effects was made to find the impacts on employment in the formal and informal sectors, the environmental impacts of transport, land fillings and waste incineration. The impacts on public expenditures and income distribution were also considered. The main findings from their study are that, to introduce a western style of waste disposal system without full knowledge of local circumstances, like informal traditions and market forces, can cause serious problems. However, because the informal sector is market driven it is sensitive to fluctuations in demand and price (van Beukering and Sharma, 1996).

Van Beukering and Sharma's model suggests that a new waste recycling policy can have serious consequences because of the vulnerability in the informal sector. If this is true an increased waste paper import that changes waste paper supply and create price fluctuations,

can have great impact on the informal sector. When waste paper supply increases it tends to push down the prices on the market and the actors in the informal sector get less profit from supplying waste-paper. Another factor that can affect the informal sector when importing waste paper can be the substitution between domestic and imported waste paper. But waste paper is only a small part of the total recyclable waste in the society, 14 % of waste-pickers income is from waste paper, plastic contributes 58% and metals 25% in India (van Beukering and Sharma, 1996).

Some governments and NGOs address the restriction on international trade in waste to force every nation to take care of its own waste, as some kind of moral obligation. But the case with waste paper import in India revealed that an import of waste can have several positive effects on the environment, but how import affects the informal sector is still unclear.

Waste paper is classified as a secondary raw material, which means that it can be recycled and used again in production. Another kind of waste material can have an entirely different effect on the waste importing country. This will be presented later in the paper.

Another thought about international trade with waste is that the increased industrialization in many developing countries creates a higher demand for raw material. The import of secondary raw material can then have a positive net effect on the balance of trade since secondary raw material is usually less expensive than the import of virgin materials. The availability of secondary raw material plays an important role in the industrialization process. As consumption levels in developing countries are low, a constraint will be the domestic supply of cheap secondary raw material, a solution to this will be to import waste. In this case waste import of secondary material can in fact stabilize the domestic markets.

Another kind of waste trade: Ship-Scrapping

Another waste-case in India is the city Alang, which is known as the world's largest ship-scrapping yard. A ship is working for about 25 to 30 years and when it has reached the end of its lifetime it is scrapped. A ship is made of 95 % recyclable material, high quality steel worth a lot of money but, unfortunately the rest of those materials are toxic and hazardous. Until recently, ship-scrapping was capital-intensive performed in huge dry-docks in developed

countries. But this kind of recycling has suddenly shifted to developing countries like India (Porter, 2002, p.113).

What's the reason for this shift? It is a combination of the lower wages in India and the higher costs of maintaining the increased level of environmental, safety and health standards in the developed countries. The positive effect for India will be a higher supply of unskilled jobs (40,000 on the beach of Alang), profit from the business and scrap steel (2.5 million tons a year). The consequences from this recycling business are the cost to the environment, safety and health (Porter, 2002, p.113).

4.3 WASTE DISPOSAL SYSTEM IN HO CHI MINH CITY, VIETNAM

Increasing urban populations and rising incomes have, in developing countries, contributed to an increase in solid waste generation. Ho Chi Minh City in Vietnam is a typical example of the growing problem of waste management in a developing country. Between 1987 and 1993 the amount of waste generated in the city quadrupled from 198,000 to 893,000 tons annually (Mehra 1996, p. 188).

Like in many other developing countries, the municipality is responsible for the waste disposal service in Ho Chi Minh City. In this formal sector governmental employees are cleaning the streets and transporting the waste to suburban dumps. Parallel to the formal sector, waste-pickers, itinerant buyers and shopkeepers are collecting and selling recycled waste.

The waste collection and recycling trade is a complicated organization with many actors, but the structure of the waste disposal services can be simplified like this: the producers of waste could be, for example, households, restaurants, hotels, markets etc. The next step in the organization structure is the collectors that constitute several levels in the system from waste-pickers selling their collected items to middlemen's and the middlemen's selling items to bigger waste shops and so on. On the same levels in the organizational structure is the formal sector collecting waste and transporting it to dump sites there some waste is collected by waste-pickers and the rest is burned. Last in this waste disposal chain are the users of the waste, these actors could be a farmer buying organic waste to use as fertilizer or industries

buying secondary raw material as inputs in their production processes (Mehra 1996, p. 190). The work relation between the actors in the waste disposal sector is characterized as principal - agent relations that are mainly based on mutual trust when lending money or delivering products. The middlemen give the waste-pickers some kind of protection in form of a guaranteed basic security of living. In return, the waste-pickers give the middlemen fixed prices at low levels (Nas and Jaffe, 2004, p. 340). This special system separates the informal sector from the municipal- or community formal waste disposal sector.

A survey has been performed on the actors in the informal waste sector. Some of the findings are that itinerant buyers collected 5 kgs to 144 kgs solid waste per day, the average buyer collecting 41 kgs /day. They collected material as waste paper, old shoes and bags, raincoats, glass bottles and aluminum cans. The waste products of highest value are products such as plastic and copper (Mehra 1996, p. 192).

The prices on the market depend on how much the shopkeepers are willing to pay for the different materials. As the sector is driven by market forces the prices will be set by the supply and the demand and the demand is likely to change over the seasons. During the rainy season the demand for waste decreases and it is highest during the dry season and before important holidays. Why this is the case is not really investigated (Mehra 1996, p. 192).

The waste shops were daily visited by on average 15 people with purpose to sell waste and, on average, each shop bought 523 kgs waste and 115 bottles per day (Mehra 1996, p. 195). The shopkeepers were also less likely to have financial difficulties compared to the itinerant buyers, only 1.15% of the shopkeepers reported being in debt (Mehra 1996, p. 196).

A thing to keep in mind here is whether the prices of waste in the informal market are affected by for example, higher consumption that increases the supply. Or, in the case when the domestic market, needs to compete with imported waste.

To sum up, the waste recycling industry in Ho Chi Minh City makes an important contribution to the urban environment and also to the economy. However, the waste sector was shaken by several factors during the 1990s. One factor is the import of higher quality raw materials that pushed down the prices of waste products. Another factor is the increased competition that faces the old recycling factories when new and modern factories are being established (Mehra 1996, p. 197). This might have a negative impact on the old factories and the people working there, but if we consider this development in the long run, there will be

possible gains from the change from old and ineffective recycling factories to new more effective. A third factor is the increased control from the government in the form of environmental regulation and protection, forcing the factories from urban areas.

When the study was made one question to the itinerant buyers was what they thought about the future in their employment situation. At the time 96% of the itinerant buyers stated that their business was either stagnant or declining. Only 4% thought that they were growing. This forecast can depend on the falling prices and the lack of demand caused by the closing of recycling factories and imported waste material (Mehra 1996, p. 198).

4.4 WASTE-PICKERS IN HOI AN, VIETNAM

Hoi An is a small fisherman-village located on the east coast of central Vietnam. The village has the last decade developed into a popular destination for both backpackers and tourists. In spite of the increasing tourism, the waste disposal services in Hoi An is very typical for developing countries.

Imagine walking down one of the streets crowded with tailors, restaurants and souvenir shops. You can notice, despite the layer of dust that covers the buildings and roads, that the street is often quite clean. The shopkeepers tidy the area outside their shops as if it is an unwritten rule that the bit of the street outside your shop is your responsibility to keep clean. Anyway, along the road comes people pulling bikes, picking up cans, paper and other valuables from the piles of garbage the shopkeepers made. The waste is well organized on the bikes and it is often hard to see the bike underneath all the waste. These people are called the waste-pickers and they are part of the informal waste disposal sector in Hoi An. Beside the informal sector the formal, municipal, waste disposal sector is operating. Every morning for the ten weeks when I was having breakfast, a loud tune was heard. The tune was an extreme version of the “ice-cream truck melody” and, when this tune was heard, the hotel staff started to collect bags of waste and brought it out on the street. The tune signaled that the municipal waste-truck was arriving and that the staff had to bring out the waste. This is an example of the formal waste disposal services. The formal and the informal sectors can work together effectively and an example of this is the garbage-bins that are placed around town by the municipality waste disposal services. People are throwing their waste into the bins, the waste-

pickers are collecting the valuable waste out of the garbage-bins and when the municipal waste truck is empties the bins, only unrecyclable waste is left in them.

5. DISCUSSION AND CONCLUSIONS

Common for developing countries is that they have abundance of the production factor labor. This gives developing countries a comparative advantage in production that needs a relatively large amount of labor. Land is another production factor that is relatively cheap in many developing countries.

The theory in chapter 3.1 about trade with harmless or hazardous waste says that in a world with free trade, a country should produce goods that need relatively large amounts of the production factor the country has an abundance of. These goods should be exported and goods that other countries can produce more effectively should be imported. This makes both exporting and importing countries better off than before trade.

The question addressed in this paper is whether handling of waste (landfill, recycling, and incineration) is suitable for developing countries. In the case of e-waste going to China it is clear that it is cheaper to recycle e-waste in China than in the US for instance. But as the theory describes, waste and especially e-waste contains toxic substances that can create negative externalities. This could be pollution, for instance, which is not included in the private marginal cost that represents the market supply of waste disposal services. The negative externality makes the trade with waste a bit more complex than trade with ordinary goods.

As the theory tells, the first-best policy when waste is traded and generates a negative externality is taxation on the output from waste disposal services. But it might be expected that government in developing countries do not have the ability or political will to implement an optimal tax on the waste disposal sector. Because the governments in developing countries often face bigger problems to deal with like poverty, starvation, high unemployment rates than to deal with environmental problems. The case-studies also showed that a considerable part of the waste disposal services in developing countries is driven by the informal sector and this sector is not controlled by the government as described in the case of Vietnam. The second-best solution in this case will be to restrict import of foreign waste at the border. The Basel Convention has put a ban on trade with hazardous waste; this could be seen to be the second-best policy. But, is a total ban on hazardous waste-trade really optimal? Probably not,

in one example we learn that some developing countries have industries that are mainly driven by import of foreign waste, such as the import of lead-acid batteries into the Philippines. For those countries it would not be welfare improving to ban the trade of hazardous waste. To sum up, the developing countries will benefit from the trade with waste if the negative externalities are controlled by taxation or import restrictions.

Are all kinds waste disposal services suitable for developing countries? It depends, waste disposal services that are capital intensive is not likely to be functioning in developing countries. For example, large incineration plants have been built in several developing countries without any success. This kind of plant needs a lot of capital to be built and probably not many workers to keep the factory going.

If we focus on the waste disposal alternative landfill, the theory in chapter 3.2 describes the relationship between transport and land costs and the optimal distance to landfill. When a developing country opens up their economy for international trade, international demands will push up the price of landfill. The domestic demand for landfill decrease because of the increased price but the domestic supply of landfill will increase. Since the demand for landfill is lower than the supply, landowners will import waste from other countries. The landowner will gain more on the international trade than the household and local business loses. The total effect of the waste-trade will be positive.

If we think outside the economic model for a moment, the households and local business in developing countries are probably much worse off than landowners. Poverty is a main problem in developing countries even if the landowner gains more than the household loses. The consumer surplus of what landowner gains could be less than the consumer surplus of what the household loses. A solution for this problem could be a domestic policy of income distribution between landowners and household.

To sum up, trade with waste is a complex problem that can affect the importing country in both positive and negative ways, and it is hard to see if there is a win-win situation or not. But if the negative externality is controlled with a tax or a regulation to push the production involving waste to the optimal level, trade with waste can be a win-win situation for the trading countries. The difficulties will be to measure the negative externalities and, therefore, to set the optimal tax.

A suggestion for further studies could be to count on how much welfare improving or not waste-trade is, when weighing the positive effects against the damages on the environment and on human health.

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