Muataz I Dobouni

UD08978SEN15826

Solid and Hazardous Waste Management

Economic Forces & Global Hazardous Waste Management

Atlantic International University
Honolulu, Hawaii
Summer 2009

Table of Contents

List of Acronyms

OECD	Organization of Developed Countries
Non OECD	Organization of non Developed Countries
NAFTA	North America Free Trade Agreement
EPA	Environmental Protection Agency
PEMEX	Mexican National Petroleum Company
LGEEPA	General Law of Ecological Equilibrium
PROFERA	Mexican Federal Environmental Enforcement Arm
TDP	Transferable Discharge Permit
ISO 14000	International Standards Organization on Environmental Management Standards

1- Introduction

Production levels of hazardous wastes and related toxic substances have been on the increase in recent decades and are projecting no signs of decline. As both historical evidence arising from tragedies and continuous research have shown, toxic substances in the form of hazardous wastes can have catastrophic consequences on the health of humans and on ecologies everywhere. While many attempts have been made to reorient economic and other factors underlying the generation and movement of this waste, none seem to have succeeded completely without creating new problems. Since these difficulties are always entirely contextual and because they are source of persistent economic disadvantages, economic sustainability in affected regions is very unlikely to be reached in the near future for this area of activity.

Among the problems is the unequal level of media attention given to damages, repercussions and costs involved with hazardous waste between OECD (i.e. developed) and non-OECD (i.e. underdeveloped) countries. This problem is manifested in the form of the "Not In My Backyard" syndrome and has become increasingly widespread in hazardous waste generating countries as well as a very evident source of market price distortions. Additional to the OECD countries, are number of other complementing realities such as rampant corruption in vulnerable economies. Combined they establish inviting conditions for irresponsible imports of hazardous waste and also create the market inefficiencies to support them.

When disposal is successful, it is only a temporary solution to the problem since the lifespan of the hazardous waste outlasts that of its containment. Through interdependencies, social, human and ecological capital is all affected and ultimately influence economic growth patterns worldwide. Cleaner production strategies as well as other attempts to alleviate generation and ultimately the irresponsible spreading of waste, can only be achieved to a limited degree using economic policy such as taxes, subsidies, standards and transferable discharge permits. Success and progress in this area varies according to the economic region in which it is attempted since it depends largely on the performance of law and institutions found therein.

I will begin by developing the context in which the problem is situated, elaborating on the origins, characteristics and effects of hazardous waste. Next, I define the scope of the problem by offering some international tragedies with regards to hazardous waste generation and disposal methods. Then we will embark in the discussion about the economic forces found in the form of trade factors and market inefficiencies that dictate the activity in this field. This last section attempts to synthesize the findings with the economic forces at play in hopes to shed light on possible solutions to the problem.

2- Description

Throughout the hazardous waste literature, definitions of fundamental descriptive terms vary greatly. The word “waste” itself does not appear to be problematic. Policy makers generally agree that waste can be considered a by-product of industrial or household activity and that it can exist in many forms. From a microeconomics perspective, waste occurs when a resource is not put to its highest valued use. This may sometimes take the physical form of residuals resulting from inefficient production or consumption activities.

Consensus comes to a halt however when the adjective “hazardous” is added to the terminology. “It turns out that there are as many legal definitions of hazardous waste as there are environmental statutes, and as many academic definitions as there are textbooks (R.A. Freeze). Studying the definitions used for hazardous waste in various countries indicates that no two systems are alike, and that some are even inconsistent with each other, which creates numerous problems (J.P.Hannequart). Citizens, technicians, businesspersons, politicians, activists - all use different approaches to describe waste and as a result, each end up with a different definition for the very same substance.

Classifying certain materials as *hazardous* is also sometimes very political; especially when it involves major internationally traded commodities within the framework of a highly regulated market. What’s more, the use of *hazardous* or *toxic* is highly context-specific: what is toxic to some (i.e. sewage sludge to those without treatment facilities) can often be beneficial to others (i.e. methane production from biodegradation of sludge).

Despite these many differences, some common elements are found across most definitions. For instance, the majority of descriptions fundamentally recognize that the use of the word *hazardous* implies that the waste is source of harm to the human health and / or ecosystems to which it is exposed. Some definitions offer more precision explaining that the substance may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunction, or physical deformation in human beings (R.A. Freeze). Equally, if not more controversial is the term *recycling*.

Recycling, as it is intended here, arrived on the scene by means of debates arising from the *Basel Convention on the Control of Tran boundary Movements of Hazardous Wastes*. At the 1998 Malaysia meeting of the parties, proposed amendments to remove loopholes hitherto allowing for uncontrolled movements of hazardous waste “destined for recycling”, ignited into debate. At the table, an intransigent global recycling industry, worth some U.S. $160 billion per year and employing some 1.5 million people around the world in the late 1990’s (Jennifer Clapp), was not prepared to alter its lucrative operations. Keeping the pressure on high, environmentalists ultimately prevailed but the issue has remained tenuous ever since.

The difficulty with *recycling* lies in determining exactly what may be (or become) hazardous once under the control of the recyclers. When proper facilities exist and recycling takes place under conditions meeting or exceeding environmental standards, the industry can be very profitable from both an environmental and economic perspective since a considerable share of residuals can be recovered and reused in production operations. On the flip side, the same operations can encourage fake recycling schemes, i.e. the use of the label of recycling for disposal operations that would otherwise be prohibited (Katharina Kummar). Also, some recycling activities are themselves sources of pollution. The recycling of newspapers, for example, generates hazardous chemical waste from the de-inking process (R.A.Freeze).

In the end, such definition problems make it extremely difficult to monitor with accuracy and consistency changes and / or patterns existing or developing in hazardous waste generation or its international movement.

3- General Analysis

Victory will be short-lived for the researcher if and when the world ever agrees on definitions for *hazardous* and *recycling.* Many other complications persist and among them are the severe inconsistencies across waste classification systems.

Clearly, there is a multitude of reasons why increased clarity in the domain of hazardous waste makes good sense. To begin with, a clearer definition coupled with a corresponding unambiguous classification system, would clarify what law is applicable where but also assist authorities in implementing and enforcing legislation to monitor and control hazardous waste (Christopher Hilz). A likely outcome is that civil and environmental law would become more effective in regulating areas such as property rights. The reality however is that many countries, in their attempt to develop a classification system, have simply resorted to testing various substances and then produce a list of those they considered to be particularly hazardous. This chaotic and disorganized approach to classification is problematic since the quality of testing processes in many countries has not kept pace with the exponential increase of new chemical on the world market (O'Neill).

Another dimension of the problem is that, from one country to the next, statistical definitions involved in the classifying process vary significantly. It is difficult for instance to compare waste in rich and poor countries. This problem also applies for advanced or highly collaborative union of countries such as the European Union which adds in its report entitled *Hazardous waste generation in EEA member countries* the following note of caution:
"In general, it is recognized that, at the European level, data on hazardous waste are not comparable. It is not currently possible to say to what extent the

variations found in the reported statistics can be explained by different: i) classification of hazardous waste; ii) systems and obligations for collecting hazardous waste; iii) reporting systems on hazardous waste data; IV) industrial structures; v) levels of application of cleaner technology, etc (Henrik Jazobsen)."

Other players in the field, such as the Basel Convention Secretariat, initially proposed and now use a system that has unfortunately managed to collect only a small amount of information from only a few countries. The Basel data collection nonetheless remains the most extensive and consistent of all that exist. In contrast to the Europeans with their waste catalogue and hazardous waste lists, are the many individual countries that have their own domestic systems characteristically and frequently at odds with those used internationally. This is the case for instance with the Russian Federation and the United States.

In the end, it is in this elaborate web of complexities that the careful analytical researcher must navigate in hopes of identifying trends and drawing conclusions from this very controversial area of economic activity.

3.1 Cumulative Disasters

During the seventies and eighties within the context of a newly developing world economy, economic arguments were used to justify the flow of very poisonous chemicals from rich to vulnerable and ill-equipped poor nations of the world. Inexistent treatment technologies and inadequate disposal facilities of the type needed for the absorption of such shipments were shortly afterwards, found to be direct causes of numerous devastating tragedies. What was witnessed at these events caught the attention of the international community and ultimately allowed for the problem to acquire the sufficient political traction needed for action to finally occur. Yet, before such action arrived, delays and politics, often known to be inseparable, continued to fuel the procrastination taxing all attempts of progress on this issue. Meanwhile, social awareness expanded incrementally for every new tragedy responsible for the loss of lives – lives often easily taken given the atrocious power inherent to these chemical creations.

On the European continent, the interest of the EC/EU in hazardous waste management issues was first sparked by the 1976 Seveso Incident, when several drums of dioxin vanished from a plant in Italy following a severe chemical explosion, only to reappear eight years later in a disused abattoir in France (Kate O'Neil).

In America, the now well-known August 1977 Love Canal Incident sufficed to put the issue of hazardous waste on the national agenda and into public consciousness:

[…] reports of black sludge bleeding through basement walls in a suburban subdivision in Niagara Falls, New York. There were initial reports of benzene fumes in the kitchen, dead trees in the backyard, headaches, skin ailments, and

respiratory discomfort; and later of dioxin and miscarriages and birth defects. The story struck a chord with the American public. It was featured on the *Today* Show (R.A. Freeze).

Despite these encounters with the catastrophic effects of toxic substances, the profits generated by their production and use remained far too great for the chemical industry to agree to reduce its output. To blame were the tastes of consumers that remained relatively unchanged despite increasing awareness of the risks associated with hazardous waste. At last, with awareness and knowledge slowly accumulating in producing societies, the industry realized that some action would have to be taken. One solution to these problems was to migrate some of the production to less regulated economies where it would not fall prey to the continuous scrutiny of established controls. The economic case for such a move seemed favorable and was therefore an easy and convincing one to make to the decision makers. With little international liability laws, a minimum of local regulatory institutions as well as much cheaper labor available, the cost benefit problem clearly favored such transitions. In a context of increased popularity of such practices, it would not be long before short-term negligence would yet again be source of great catastrophe.

On the night of December 2, 1984, a storage tank at a US -owned pesticide plant in Bhopal, India burst open, releasing a cloud of poisonous methyl isocyanides gas toward the town Jayaprakash Nagar that bordered the plant. It was reported that the children and adults alike were “struck down, gasping for breath, clutching at burning, hurting eyes and chests, frothing at the mouth… and then choking on their own vomit and blood (Sanjoy Hazarika). The accident would claim more than 6000 lives within a week and over 16,000 to date, going down in history as one of the world’s worst environmental disasters (Hilary F. French).

All these, it must be noted, are only select examples of an already limited area of public knowledge. Yet it has been plentiful for the public to draw lessons from it, albeit by means of tragic sounds and catastrophic images of the victims that have fallen every time so innocently from them. Countless other incidents however remain unknown or completely unaccounted for – at least, for the time being. This is true in the case of the voyage of the *Khian Sea*. Leaving from Philadelphia in August 1986, the ship was loaded with toxic ash from municipal incinerators in search of a location to dump the waste. The strategy backfired as the ship spent close to a year and a half in the Caribbean Sea looking unsuccessfully for a dump location. A partial release in Haiti provoked uproar and forced the ship to continue its journey to five continents, changing its name three times. According to its owners, it is reported to have eventually discharged its load at some undisclosed location in late 1988 (Hilary F. French).

Examples are plentiful and simply too many to list in full. Over time, the culmination effect of these events led to the tightening of laws concerning hazardous waste in their principal producing economies: namely the United

States and the European industry. It was not long afterwards before cases of waste dumping were found in Africa. In 1988, in the small fishing village of Koko in Nigeria, were discovered 8000 drums of highly toxic waste, including methyl melamine, dimethyl formaldehyde, ethyl acetate formaldehyde and about 150 tons of polychlorinated biphenyls (PCBs). Many of the Nigerian workers who helped remove the waste were hospitalized with severe chemical burns, nausea, vomiting of blood, and partial paralysis and one person fell into a coma (Iibid). Behind it all was an Italian waste disposal firm that would later take responsibility. Meanwhile, in a symbolical yet deeply meaningful political gesture, Nigeria had recalled its ambassador from Rome (Hiltzik).

All of the above incidents have served as examples of the short-term effects resulting from exposure to toxic substances. In each case, local health systems likely received sudden unexpected increases in demand for services and treatments leading to the intensification of capital and labor investment needs. However, unlike other tragedies, the consequences arising from exposure to toxic chemicals or hazardous waste extend far into the future. In small and devastated communities, the labor force is drastically affected, arable land contaminated and the local economy often gravely ruined from the sum of these consequences. Yet, as will be explored later, movement of harmful substance to regions unprepared for its absorption is still, despite international controls, a persisting trend supported by contemporary economic reasoning.

3.2 International Controls

Once after the public was widely informed, it eventually became apparent to politicians also that the rich nations had been successfully mitigating many of their domestic toxic catastrophes by sending them elsewhere. At the same time, firms were lowering their costs of chemical production by establishing themselves in the developing world where many economic advantages existed for them. The African nations condemned the practice as “toxic terrorism” and “garbage imperialism” (Christopher Hilz) leading them to a long and strenuous battle that would ultimately win them enough political traction to align the world’s nations behind the *Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and their Disposal*.

Their work was accelerated by the fact that by the late 1980’s, environmental groups in the rich nations, had managed to build up enough publicity around the cause that public outcry was loud and clear to politicians. The Convention however, only limited the movement of Trans boundary hazardous waste – it did not ban its production nor completely stops its migration. As such, parties without the proper disposal facilities were allowed to continue exporting.
Nevertheless, by the mid-1990 the movement of such waste from OECD to non-OECD countries was reported as *officially* slowing down. Some would quickly credit this success to the Convention, but in the end it was proved to be largely because of the increase in media attention. What is important to note in all of

this, is that movement of hazardous waste never did stop completely. On the contrary, it managed to take on new forms allowing it to camouflage itself in other areas of waste disposition that were much less scrutinized by the public eye – such as “recycling”. The None Government Organization NGO’s, uneasy with this Convention loophole from the very beginning lobbied for the addition to the Convention of control measures dealing with this “recycling” activity.

In 1994, parties agreed voluntarily to ban all exports of wastes, both for disposal and for recycling purposes from OECD members to non-members. Along with this ban came fresh new complications to replace the void created by the elimination of the exports debate. For one, at the 4th Meeting of the Parties, in Malaysia in February 1998, delegates made only limited progress on drawing up comprehensive lists of hazardous wastes for the purpose of the Convention (O’Neil).

What’s more, this ban on exports also became an incentive to migrate entire hazardous waste producing industries abroad – a development arriving at a time when empirical data was beginning to show that such “pollution havens” were already in existence (See H. Jeffrey Leonard). Also on the list of complications were the free trade restrictions imposed by the Convention. The problem existing here was that libertarians who argued against such barriers to free trade often did so neglecting the realities of the long term costs likely to result in regions ill-equipped for proper treatment and disposal.

Many of these disagreements have yet to be resolved and the Convention itself still awaits complete ratification from its signatory parties. Notable exceptions to treaty ratification include many less developed countries and the United States, which claims that its domestic regulations are adequate to ensure the proper control of hazardous waste movement (O’Neil). Thus, caught inside these deep, complex and lasting political disputes, there is little hope that international law alone will ever succeed in giving the world a hazardous waste trade whose damages will be distributed fairly across all parties it involves.

4- Actualization - Case Study

4.1 Hazardous waste Trans Boundary along the United State- Mexico border

The border region between Mexico and the United States is one of the clearest examples of an economic integration between two countries with profound economic, social and judicial asymmetries. This process has had severe environmental, social and economic consequences which even after nearly six years have passed since the North American Free Trade Agreement NAFTA went into effect, it have not been dealt with in an equitable and bilateral manner.

The process was initiated in 1964, when the United States unilaterally broke the Agreement on reception of Mexican workers, known as the "Bracero Program" and Mexico pronounced the 1965 "Decree of Industrialization of the Border Zone." This decision imprinted a model in which each country separately pursued its own policies for a problem which became undoubtedly bi-national in scope.
In essence, just as the United States freed itself from excess Mexican workers in 1964, in large part because of a downturn in the economic cycle, Mexico attempted to retain this flux of workers by decentralizing industrial production toward the north, taking advantage of its giant neighbor and the so-called competitive advantage of the area.

Since then the industrialization process, better known as the Maquiladora export industry, has taken on its own weight, extending itself to the south of Mexico, Central America and the Caribbean, with it all of its adverse environmental impacts.

The Maquiladora production and trade model deepened Mexico's dependency on the industrial dynamic of the United States. Until the 1990s, the increase or decrease of Maquiladora production was tied directly to the increase or crisis of U.S. industries as typified in 72-73, 83-84 or 90-91 periods. After 1992, the expansion of the Maquiladora industry toward the south as well as its expansion into new sectors like auto parts, services, or textiles increased, deepening its dependency on the investment policy of other countries, principally the United States, and reproducing a model of investment without adequate requirements of environmental compliance.

A terrible consequence of the development model is the accumulation over decades of an enormous environmental contamination produced by the hazardous wastes of the industrial and urban processes of these Maquiladora enclaves. Under a policy where all manner of economic and infrastructure incentives have been granted to attract foreign investment with practically no performance-related requirements (such as compliance with labor laws or environmental laws in their own countries, nor a certain percentage of national inputs), nor with any requirement to provide environmental infrastructure nor with complete compliance with Mexican environmental and labor legislation, the environmental debt of the border region is enormous.

4.2 Bi national Context of Hazardous Wastes

The industrialization of the U.S. - Mexico border region over the last 35 years has been companied by the generation of millions of tons of hazardous wastes. (Just how much is difficult to say but in 1997 the EPA reported nearly 20 million tons were generated in the U.S. Border States (U.S. EPA). Defined in both countries as waste that is corrosive, reactive, ignitable or toxic, these wastes represent

dangers for public health and the environment, more so if improperly managed. Hazardous waste can be reduced its impacts at each stage of the production process, as well as in the use and disposal of manufactured products. Thus, many of the industrial products themselves such as tires, batteries, oils and solvents, in turn present potential hazards to human health and the environment once used, deposited, incinerated or treated.

Industrial production has flourished in Southern and Central California, along the Gulf Coast and in the central corridor of San Antonio, Austin and Dallas-Fort Worth in Texas, and to a lesser extent in Arizona and New Mexico. In Mexico, the growth has been more spectacular, as cities such as Tijuana, Ciudad Juarez and Matamoras now count hundreds of industrial production facilities known as "Maquiladoras" within the municipal area. In addition to these newer facilities, more traditional sectors such as petroleum exploration and refining, metal and other mining and steel manufacturing are also present in both countries. All of these facilities are involved in the generation of "hazardous" waste, with real and potential negative impacts to workers, neighborhoods, land, water, air, flora and fauna. Some of the documented problems on both sides of the border have included:

1- Hazardous waste dumped illegally just outside city limits, often in unique desert habitat;
2- Exposure of neighborhoods and communities to abandoned or closed waste sites or industrial facilities with hazardous waste which hasn't been cleaned up;
3- Hazardous waste from major industries brought to municipal landfills which can not safely store such wastes;
4- Transportation spills and accidents involving hazardous wastes, often by illegal transporters lacking safety equipment, response training or liability insurance;
5- Exposure of workers in factories to hazardous wastes with disastrous, sometimes fatal, health effects;
6- Water pollution due to inadequately treated industrial process wastewater and runoff from hazardous waste stockpiles;
7- Opposition by local, state and federal environmental authorities to the participation of environmental groups and communities in decisions about hazardous waste management facilities; nonetheless, these groups are often able to stop the issuance of permits to operate these permits, or temporarily or permanently close these facilities.
8- Emergency response units in border communities insufficiently trained, equipped, coordinated and open to public input, often leading to delays in response to industrial accidents, spills and explosions.

One positive development in both countries has been the relatively recent focus on "pollution prevention", including source reduction, reuse and recycling. Rather than producing hazardous wastes as part of their production process, pollution

prevention and source reduction approaches focus on minimization and where possible, elimination of hazardous wastes altogether by simply not producing them. Both the U.S. and Mexican governments place source reduction as the top priority in their hazardous waste management regimes, and many large industries have significantly reduced hazardous waste generation, at least in part because of this new focus. Many industries also find ways to reuse or recycle the hazardous waste they produce, either at their own plants or at commercial facilities.

Nevertheless, many industries continue to operate in the same manner that they always have and the search for adequate recycling, treatment and disposal facilities continues. This is because without strict enforcement of environmental regulations in both countries and without clear economic and legal incentives for industries to reduce pollution at the source, the possibility for significant reduction is limited.

4.3 The Economic Roots of Hazardous Waste

Many of the problems associated with hazardous waste in the border states are attributable to the economic development strategies Mexico enacted in an attempt to increase employment and exports. Mexico's industrialization in the 1960s and 1970s was based upon the development of PEMEX The National Mexican Petroleum Company, and the Maquiladora program, established in 1965. PEMEX's operations developed with few environmental controls and relative impunity from enforcement. The Maquiladora program has been a successful attempt to increase foreign investment and develop industrial production in the northern border.

Nevertheless, these strategies were generally implemented without the development of basic infrastructure -- wastewater treatment plants, hazardous waste management facilities, water treatment and safe roads. During the debate on NAFTA, the estimated cost to provide environmental infrastructure for the border such as clean water, treated wastewater and solid and hazardous waste facilities could be ranged from $8 to $20 billion, with most of that need in Mexico. At the same time, and because maquilas paid few, if any taxes, local governments have not been able to provide such basic services. A recent proposal by Mexico to change the status of maquila plants to "permanent" establishments would impose a tax on profits in Mexico, and Mexico and the U.S. are negotiating this change, because many industries are concerned they would be "double-dipped," taxed in both the U.S. and Mexico on their profits (Chris Karaul & Jamis Smith). Most of the revenues generated from maquila production have flowed to Mexico City, and have not been redistributed equitably to the border region.

Although the Maquiladora program began officially in 1964, its take-off did not begin until 1974 and it was only 14 years later that Mexico passed the 1988

General Law of Ecological Equilibrium (LGEEPA), which contains basic policies and regulations on the management, export and import of hazardous Wastes. Because Mexico had neither the regulations nor the facilities to manage hazardous waste, the La Paz Agreement was signed by the U.S. and Mexico allowed maquiladoras to return hazardous waste to the country from which the raw materials were originally imported, usually the U.S., a provision which became a requirement under the LGEEPA. In addition, the 1988 General Law prohibited the importation of hazardous waste into Mexico for final disposal, while allowing hazardous waste imports for recycling and treatment.

Even after passage of the 1988 law, Mexico has attracted industrial development by keeping both labor and environmental costs low, in part through limited enforcement and not requiring adequate environmental infrastructure. As long as there is not adequate enforcement, incentives to dispose of waste properly do not exist. In addition, while state and local environmental officials may more closely monitor the day-to-day operations of industries in their areas, enforcement of maquiladora regulations and hazardous waste regulations is a federal issue in Mexico. Local officials must depend on PROFEPA The Federal Environmental Enforcement Arm -- to inspect and enforce these regulations. PROFEPA is also charge with receiving and responding to environmental complaints by citizens. But PROFEPA has extremely limited human resources to oversee environmental regulation compliance at the 3,000 maquiladora plants, as well as national industries. PROFEPA does report conducting inspections at 3,807 sites and 1,403 maquiladoras in the border areas between 1996 and July of 1997 (US EPA).

Every time Mexico suffers through a peso devaluation -- as in 1982, 1987 and most recently, December of 1994 -- the number of maquiladora employees and plants jumps. Today, there are about 3,000 such plants employing one million people throughout Mexico. While these peso devaluations help keep wages low and thus attract more investment, they also add an incentive to dump illegally because the costs of proper management of hazardous wastes in the U.S. remain high, and must be paid in dollars. Moreover, the peso devaluations and resulting economic crisis have shrunk the Mexican federal government's resources available for building basic environmental infrastructure like wastewater treatment plants and for enforcing environmental rules.

5- Discussion – Economic Forces in Waste Trans Boarder Movement

The situation of hazardous Waste Trans Boarder movement has left more questions than answers. Just how much waste is produced in the border region? We don't know. How much crosses the border? We don't know. How is waste managed? We don't know. Is enforcement an effective deterrent and incentive? We think not, but we really don't know.

However, some basic questions about hazardous waste management where the answers could include the following:

1. The most cost-effective waste management strategy along the border is pollution prevention at the source, not the creation of an elaborate system of hazardous waste management facilities.
2. The attempt to locate adequate hazardous waste landfills at the source where the hazardous waste is generated.

5.1- ENVIRONMENTAL ECONOMIC POLICIES

In addition to the factors of trade established with regard to Trans Border movement of hazardous waste, some economic controls and approaches can further influence market forces to determine trade flows, generation levels, disposal and treatment methods of hazardous waste. These controls are generally helpful in mitigating risks and / or alleviating pollution in certain regions thus leading them to increased benefits and / or lowered costs. Most of these policies require good governance and reliable judiciaries to take full effect since they are efficient only with the presence of strong authority.

5.1.1 Economic Incentives for Cleaner Production

At its most extreme level, cleaner production means no production of toxic wastes whatsoever. In this case, trade irrespective of economic forces, would obviously stop spreading hazardous waste. This is however an unlikely scenario and for the time being, generally not aligned with the demands and desires of consumers worldwide.
At a less extreme level, clean production is more efficient and reduces the amount of residuals generated partially or entirely. This means technologies make less intensive use of natural resources, are energy efficient, eliminate the use of toxic raw materials, and / or eliminate or at least reduce the quantities and toxicity of wastes at all stages of the product's life cycle (Jennifer Clapp). Internationally, the United Nations Environmental Program launched a "Cleaner Production Program" in 1990 to promote cleaner production among firms and governments and to facilitate the transfer of cleaner technologies globally(UNEP). Economic policies leading to such cleaner production can take the form of standards, pollution taxes, subsidies and permits and lead to incentives for greater investment in research and development.
Cleaner production strategies have economically been devastating for pollution intense industries but at the same time very beneficial for environmental products production and services. A remaining challenge however, is that in the cost-benefit analysis, it is difficult to demonstrate the potentially large benefits of cleaner production when at present it is so little practiced (Jennifer Clapp). There are also other economic problems with cleaner technologies. For instance, these problems include the greater profitability of cleanup as opposed to clean technologies and the capture by industry players of the process for developing

industry guidelines for cleaner production with the result that they do not provide solid enough incentives for industry to abandon hazardous production processes (ibid).

5.1.2 Taxes and Subsidies

Taxes and subsidies to control hazardous waste management locally both have their advantages and disadvantages. To begin with, any tax placed on units produced of hazardous waste in an attempt to reduce their generation may create an incentive for generators to conceal the real amounts they produce. However, they could also create an incentive for generators to invest in the research and development for new, less pollution-intensive technologies.

As for subsidizing the legal disposal of hazardous waste, it can help remove the temptation for illegal disposal but at a cost. This cost is that there is a deadweight loss arising from the added taxation needed to finance the subsidies. What's more, subsidies in reducing the private costs of hazardous waste disposal may encourage the production of more (Richard C. Porter). Those subsidies aimed at decreasing generation work in a way such that all reduced emissions are rewarded by a payment. They act therefore as an opportunity cost: when a polluter chooses to emit a unit of hazardous waste, it is in effect foregoing the subsidy payment they could have had if they had chosen to withhold that unit instead (Barry C. Field).

All in all, if carefully used, taxes and subsidies on hazardous wastes, can be a feasible way of providing the incentive for reducing the quantities produced and for authorities to better control its movement and final disposal location. Improper use of such tools can bring contrary results that would preferably be avoided.

5.1.3 Transferable Discharge Permits

Transferable Discharge Permit (TDP) policies represent another centralized approach to using the economy to obtain some control over the generation and the trade of hazardous wastes. For TDP's to be effective however, they require a single market where suppliers and demanders may interact openly and where knowledge of transaction prices is publicly available to all participants (Ibid). For this market to function efficiently, the resource (in this case the permits), must be scarce or limited in quantity to have value. When dealing with hazardous waste, given their characteristics, some problems arise with using TDP policies. For one, given the variances in the quality of treatment and disposal facilities found from country to another, regulators must go against market forces in order to fairly distribute these permits. What's more, it is very unlikely that information will be shared and made available equally to all participants because of corruption and differences in media concentration. There may also be environmental, social and / or political conditions found in certain areas that warrant increases or decreases in permit allocation. Not to forget also are the costs and the

challenges involved with the monitoring activities intended to verify whether generators exceed the number of permits are allocated to them.

5.1.4 Standards

A very practical problem in standard setting is whether it should be applied uniformly to all situations or varied according to circumstances (Ibid). Standards will be cost effective only if all generators of hazardous waste have the same marginal costs for abating their pollution – a situation not likely to found in practice. Thus, when they differ, individual standards tend to be more cost effective. The problem however is more complex. In many cases, for example, removing uniform standards leaves countries with no set minimum objective to use as a benchmark. This may be the case where institutions are not well developed or not present at all. Thus, while uniform standards may not be ideal under all circumstances, they are sometimes the best of controls to limit instances of mismanagement and / or tragic accidents.

To lower costs in the long term, producers of hazardous waste are often encouraged, if not forced by legal technology standards, to invest in research and development. When firms are subjected to generation reduction requirements, they are given incentive to engage in research and development to find better generation reduction technology (Ibid). This activity may draw resources away from output production activities but will be beneficial in the long run since it will reduce the marginal costs of abatement uniformly across emission levels. The idea behind such an approach is to help stimulate ingenuity and hopefully develop more efficient methods and technologies for generation, disposal and treatment of waste.

As a matter of fact, sometimes, times even the research, development or implementation of new waste minimization technology lead to even greater harm. A good example of this is sediment runoff from construction sites for new treatment plants or sewer lines (Ibid). Another example is the recent growth in the high tech sector that has brought new levels of computer power capable of automating a number of monitoring, enforcement and remediation activities previously too complex, lengthy or costly to carry out. Accompanying this progress is the unsurpassed technological growth and manufacturing responsible for the generation of large amounts of hazardous waste.

Technology standards can also prescribe practices generators must adopt, voluntarily or otherwise. These sometime take the form of voluntary codes of conduct such as the ISO 14000, the International Standards Organisation's environmental management standards:
"Industry has argued that voluntary measures are preferable to command and control regulations set by government because they bring not just environmental benefits but also economic benefits through improved efficiency as well as enhanced public image (Schmidheiny & W BCSD)."

Such codes therefore can sometimes lead to outcomes similar to that arising from market-based initiatives. ISO codes in particular are rapidly gaining wide recognition and acceptance among businesses and states in rich and poor countries alike with their firms trying to learn more about how to adhere to such standards (Jennifer Clapp). These codes are beneficial in part since they can help spread the know-how about disposal and treatment technologies and alleviate in the process many uninformed and dangerous practices. Safer import conditions and more homogenous practices from one jurisdiction to another can facilitate and add fluidity to the trading activities. On the other hand, while amendable, the successful spreading of such uniform standards may discourage the search for improvements and may reduce the diversity of known practices.

6- General Recommendation

Future decisions, political or otherwise, must not only consider the biosphere for reasons of sustainability and race survival, but must also evolve in content so as to account for the environment as a finite, interconnected and closed system.

The global economic system, incidentally, also happens to be a finite, interconnected and closed system. While the two systems may be studied in great depth individually, the strong inevitable connection between the two receives far less attention than would be expected given its importance to human survival. It is evident that as long as economic activity persists on earth, it will be impossible to sway these systems away from mutual dependence: humans must have nature and its resources for survival much like, as we have only recently acknowledged, nature needs discipline among humans to operate at full strength. From time to time, when humans think themselves too dominant, nature reminds them that they are relatively powerless. In the case of hazardous waste production, nature has tools such as bioaccumulation, natural spreading and well-developed interdependencies, to demonstrate that what is produced unsustainably today will plague everyone long into the future.

Economic activity requires raw resources in order to produce consumer goods. These resources are available only in nature and must eventually partially return to it in the form of residuals. Sometimes however, these residuals can be fed back into production activities by means of recycling. In all other cases, nature decomposes residuals at various rates and ultimately regenerates the raw resources necessary for the cycle to continue innocuously. Over time however, human economic activity has interrupted this cycle in three ways:

A- Technology has created a wide range of substances that do not exist in nature. Human discards are thus increasingly comprised of plastics, metals, and natural materials laced with hazardous substances (for example, bleached and inked paper), which, in many cases, are difficult or impossible for natural ecosystems to break down.

B- Industrial societies use and dispose of much more material per person than their predecessors, and than their counterparts in the less industrialized world.

C- Rapid population growth increases the number of people and the total amount of waste generated. As a result, the global ecosystem is overwhelmed, both quantitatively and qualitatively, with what we discard (Clobal Anti Incineration)." Thus, humankind is faced with a very difficult and alarming scenario in which an increase in the scarcity of resources happens to be synchronized with an increasingly contaminated planet. Adding to the mêlée, health and other social damages resulting from toxic wastes triggers the emergence of a very sobering economic reality. Worse still, since many of these toxic wastes not only bioaccumulation but also only rarely decompose in reasonable time, what results is a slow but real "self-poisoning" activity unleashed within the limits of the closed biosphere system.

In the long run, macroeconomic issues such as growth or decline depend largely on the accumulation of capital – human, social, ecological and manufacturing. The production possibility frontier of market goods vs. environmental quality over time may, under unsustainable practices, regress towards the origin. It is conceivable that damaging the environment too much today will affect future possibilities

That said, there exist two immediate areas of concerns. First is the issue of intergenerational justice which, for the purposes of this work, revolves mostly around the idea that current generations are stockpiling chemical time bombs knowing very well that detonation is an unavoidable future certainty. This problem of intergenerational equity becomes problematic when it is understood literally, in a fashion that ascribes rights to future generations and obligations for present generations (Elli Louka). The second is the indifference of electorates worldwide resulting from poor information and leading to insufficient political will to curb current levels of toxic releases and generation volumes.

In closing, a note must be made regarding the irony created by the existence of these natural and economic interdependencies. Fearing threats to their own well being, developed societies often force the movement of hazardous waste to some of the most vulnerable regions on the planet. Unfortunately in so doing, it is neither realized that the lifespan of most of these chemicals exceed that of humans, nor that nature always finds a way for the substances, often under poorer (if any) controls and regulations, to travel back to their sources. This time around however, while they may arrive in some other form or reduced in levels of toxicity, the chemicals will not be subjected the safeguards and controls initially effective in mitigating their dangerous effects.

7- Conclusion

It is apparent from the findings delivered by this paper that the issue of hazardous waste, even following the implementation of controls and regulation such as the Basel Convention, is still very much of valid concern. While some evidence demonstrates that the bulk of hazardous waste is circulating among nations capable of managing and treating it safely, other results raise suspicion about why Territories and non-OECD Non Developed Countries are still receiving such shipments. Of concern also are demonstrations that the more corrupt non-OECD countries tend to be, the more likely they are to be importers of hazardous waste. As for OECD countries, higher corruption levels match higher exporting tendencies.

Disparities in the quality, availability and quantity of information available from one economic region to another is at the source of distortions found in both prices and in public perceptions of the risks involved with hazardous waste. These problems make it very difficult for economic policies and other controls to function properly and as a result allow for the spreading of the waste to continue. Thus, it can be concluded that while economic forces may appear responsible for some of the damages caused by the generation and movement of hazardous waste, all are ultimately nothing but the flawed product of deficient institutions and judiciaries. Under perfect market conditions and accounting methods, cost benefit analyses would be expected to always sway decisions towards the more beneficial of available options. It is therefore perhaps only a question of time and persuasive political work before such objectives can be approached and hence, hope remains that one day, markets alone will safely handle this issue of hazardous waste.

References

Trade Measures in the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Paris: Organisation for Economic Co-operation and Development., 1998.

Batstone, Roger, James E. Smith, David Wilson, World Bank, World Health Organization, and United Nations Environment Programme. *The Safe Disposal of Hazardous Wastes : The Special Needs and Problems of Developing Countries.* Washington, D.C.: World Bank, 1989.

Blais, Jules M., *Arctic Seabirds Transport Marine-Derived Contaminants*, Science, Vol. 309, 15 July 2005.

Clapp, Jennifer. *Toxic Exports : The Transfer of Hazardous Wastes from Rich to Poor Countries.* Ithaca: Cornell University Press, 2001.

Field, Barry C., and Nancy D. Olewiler. *Environmental Economics.* 1st Canadiand ed. Toronto: McGraw-Hill Ryerson, 1994.

Freeze, R. A. *The Environmental Pendulum : A Quest for the Truth about Toxic Chemicals, Human Health, and Environmental Protection.* Berkeley: University of California Press, 2000.

French, Hilary F. *Vanishing Borders : Protecting the Planet in the Age of Globalization.* 1std ed. New York: W.W. Norton, 2000.

Hazarika, Sanjoy, *Gas leak in India kills at least 410 in city of Bhopal*, *The New York Times*, New York, N.Y.: Dec 4, 1984.

Hilz, Christoph. *The International Toxic Waste Trade.* New York: Van Nostrand Reinhold, 1992.

Jacobsen, Henrik, Matthew Crowe, Jens Brodersen, European Environment Agency, and European Topic Centre on Waste. *Hazardous Waste Generation in EEA Member Countries : Comparability of Classification Systems and Quantities.* Copenhagen, Denmark; Luxembourg: European Environment Agency; Office for Official Publications of the European Communities, 2002.

Krueger, Jonathan. *International Trade and the Basel Convention.* London, England: Earthscan.,
1999.
Kummer, Katharina. *Transboundary Movements of Hazardous Wastes at the Interface of Environment and Trade.*

Louka, Elli. *Overcoming National Barriers to International Waste Trade : A New Perspective on the Transnational Movements of Hazardous and Radioactive Wastes.* Dordrecht ; Boston; Norwell, MA, U.S.A.: Graham & Trotman/M. Nijhoff; Sold and distributed in the U.S.A. and Canada by Kluwer Academic Publishers, 1994.

O'Neill, Kate. *Waste Trading among Rich Nations : Building a New Theory of Environmental Regulation.* Cambridge, Mass.: MIT Press, 2000.

Porter, Richard C. *The Economics of Waste.* Washington, DC: Resources for the Future, 2002.

Schulze, Gèunther G., and Heinrich W. Ursprung. *International Environmental Economics : A Survey of the Issues.*