DEMYSTIFYING THE IMPACTS OF A BASEL BAN AMENDMENT RATIFICATION BY THE PHILIPPINES

ATENEO DE MANILA UNIVERSITY

ABOUT BAN TOXICS!

BAN Toxics! is an independent, non-profit, non-governmental, environmental organization that seeks to:

1. Promote environmental justice in the Philippines and the Asian region, ensuring that developing countries in the region do not bear a disproportionate burden of pollution coming from developed countries.

2. Prevent toxic trade in products, wastes, and technologies, particularly trade from developed to developing countries in the Asian region through the promotion of self-sufficiency in waste management, clean production, toxics-use reduction, and other sustainable and equitable practices or methodologies.

3. Reach out and work in solidarity and partnership with allied groups locally and regionally in Asia, striving to instil a broader consciousness of the interrelatedness of each community, each country, within the region and to uphold our collective fundamental human right to life and to live in a healthy and peaceful environment.

4. Promote a new earth economics that accounts for nature's services, and the disservices from pollution, that internalizes all costs including those transferred to the global commons, disenfranchised communities, the environment and the future.

5. Develop local and regional initiatives through research, investigation, and policy dialogue with government and grassroots organizations in order to actively share information and expertise through workshops, conferences, newsletters, reports, films, web features, and through other similar or as yet undeveloped media.

BAN Toxics! works closely with local, national and international environmental NGOs, intergovernmental organizations, and academic institutions using both local and international campaigning, capacity-sharing and bridge-building between activists in Asia, and throughout the world.

BAN Toxics! is a duly registered non-profit, non-governmental organization with the Philippine Securities and Exchange Commission.

BAN Toxics! is the Southeast Asian office of the international environmental justice group Basel Action Network (BAN). BAN is a duly registered 501 (c)(3) charitable organization of the United States, based in Seattle, Washington.

BAN Toxics! is also an active member of the Zero Mercury Working Group.

We are based in Quezon City, Philippines.

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DISCLAIMER

PREFACE

Hazardous materials and wastes management has been an atypical economic considerations versus environmental and social protection in the Philippines, for over three decades now ever since the concept gain international notoriety A sophisticated piece of legislation, Republic Act (RA) 6969 or The Toxic Substances, Hazardous and Nuclear Wastes Control Act was passed in 1990 to "to regulate, restrict or prohibit the importation, manufacture, processing, sale, distribution, use and disposal of chemical substances and mixtures that present unreasonable risk and/or injury to health or the environment; to prohibit the entry, even in transit, of hazardous and nuclear wastes and their disposal into the Philippine territorial limits for whatever purpose; and to provide advancement and facilitate research and studies on toxic chemicals."

In 1993, the Philippines became party to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, which aims to, among others, restrict the transboundary movements of hazardous wastes except in cases where it is perceived to be in accordance with environmentally sound management principles. However, inconsistencies between this international treaty and local laws; unequal technological capacity for safe waste transport, storage, and disposal between developed and developing nations; and unclear technical guidelines give rise to numerous social, environmental, and economic issues. Thus, an amendment to the Basel Convention is being sought.

To date, this has not been ratified in the Philippines, and several sectors have been debating its merits. Should the Philippines ratify the Basel Ban Amendment? This study focuses on the economic, environmental and health impacts of the hazardous waste or materials recycling activities in order to aid in policy making. More importantly re-examines the long-held beliefs and notions about hazardous waste trade, having in my mind that the Convention has had 24 years of rich history and developments. The economic landscape in 1989 to present day 2013 has vastly changed that the rationale for withholding ratification of the Ban Amendment may be nothing more than illusory today.

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THE EVOLUTION OF HAZARDOUS WASTES

In pure and simple terms, "waste" is the unwanted by-product of things consumed or utilized. The consumption or utilization of these things – be it the things that naturally occur in the environment such as vegetation and minerals, or the man-made things that are produced from processing raw materials – is thus key to understanding the problem of waste.

Pre-historic human societies consumed or utilized bare resources from their environment, but over time people learned to undertake processes in order to make other things from the bare resources. Up until the mid-18th Century Europe these consisted of simple processes ranging from hand spinning of wool to make all-cotton fabrics to blacksmithing in order to make farming tools and implements – basically processes that rely on muscular power and in which the unwanted by-products are, by and large, wastes with physical form or 'solid waste' and generally have innocuous impacts on the ecological system.

INDUSTRIAL PRODUCTION AND MASS CONSUMPTION

Thereafter, the Industrial Revolution, a period of time that saw the transformation of hand production to mechanized or machine-assisted production, happened and caused an exponential growth in production. Through mechanization, that started in the textile mills of England, one machine attached to a spinning wheel could produce the same amount of textile that previously took 50 persons to make[1].

The cost of production, in textile and iron-making as well as in the transport, communications, agriculture, energy and mining sectors, rapidly went down resulting to more and more people being able to consume or use the fruits of mechanized production, thereby fuelling further production and an even greater, behavioral pattern of consumption or what is known as consumerism.

Moreover, since mechanized production in this period relied heavily on the steam engine, one of the great inventions during the Industrial Revolution, which in turn was powered by burning coal, unwanted by-products – in the form of smog and soot – were generated copious amount. For the first time waste was being generated in large quantities, as the multitude of production houses or 'factories' in England operated at the same time. For the first time as well people were dealing with the widespread wastes that were coming out from the industrial processes and which are largely by-product of chemical changes, such as burning of fossil fuels and steel-making, to name a few, and from which 'chemical wastes' are generated.

[1]Lewis, H., (1992) Industrial Revolution, Europe Transformed, available at http://history-world.org/Industrial%20Intro.htm, last accesed 31 July 2013

One of those critical of the waste brought about by the industrial operations was English writer William Morris who, in his epic poem The Earthly Paradise, cringed at the conditions of London in 1870. He wrote:

> *Forget six counties overhung with smoke,*
> *Forget the snorting steam and piston stroke,*
> *Forget the spreading of the hideous town;*
> *Think rather of the pack-horse on the down,*
> *And dream of London, small, and white and clean*
> *The clear Thames bordered by its gardens green ...*
> (Excerpt from The Earthly Paradise)

In addition to being an immediate eyesore and source of stench, the accumulation of wastes in European cities such as London and Edinburgh unravelled the hazards that wastes may bring to the population – diseases and other ill-effects to the environment and society. The thick smog and soot brought London to a halt as traffic was disrupted, and more dangerously, it caused an upswing in death rates[2]. During a week in 1873 over 700 people were killed in London due to respiratory problems, another 2,000 deaths occurred in 1880, and in just a matter of three days 1,000 people died due to smog-related causes in 1892[3].

However, the realization that wastes causes widespread danger or hazard (hazardous waste) or that it can be poisonous or toxic due to its chemical composition did not deter industrial production in Europe and elsewhere as household and national incomes also grew with the rapid increased in production. In the beginning of the 20th Century, the United States (US) joined England and other European countries at the forefront of industrial production process or manufacturing, as Americans invented the system of 'assembly line' production. The assembly line system was so effective that economies of scale, the idea that there would be cheaper costs if productions are done on a bigger or wider scale, became the dominant thought in production leading to 'mass production'.

CONSUMERISM AND THE THROW-AWAY MENTALITY

Newer technologies and knowledge, such the use of oil, gas, and electricity to power machines, advanced bio-chemical processes in food, cosmetics and foodstuff production, and the like marked the rest of the 20th century. The scientific discovery of 'polymer' in the 1920s – a

[2]Oosthoek, J., Environmental Histroy Resources, available at http://www.eh-resources.org/timeline/timeline_industrial.html, last accessed 31 July 2012

[3]Diseases in Industrial Cities in the Industrial Revolution, available at http://www.historylearningsite.co.uk/diseases_industrial_revolution.htm, last accessed 31 July 2013

molecular structure that can be manipulated to create a variety of "plastic"[4] products such as Styrofoam, PET (polyethylene terephthalate) Bottles, PVC (polyvinyl chloride) used for plumbing pipes and so many more that doesn't naturally degrade even after decades, further aided the growing consumption and gave rise to a throw-away mentality in which things are disposed of after a single use.

This even greater production or manufacturing of consumer goods and other things with economic value (or simply goods) became the standard measurement of a nation's wealth and level of development, through the Gross Domestic Product (GDP) and National Income Accounts system, that were developed in the 1940s. Roughly around the same time, countries outside Europe and the US started employing a de facto industrialization policy, led by Latin American countries (though not with same extent of success) as well as in Australia where the industrialization proved to be more stable. Later in the century, Asian countries such as Japan and South Korea, followed with their own industrialization and mass production.

The most industrialized country, the top manufacturer of goods, and consequently the most developed country in the world however is the US, ever since it overtook England in terms of economic production sometime in the early 20th century. But even in the US, concerns about the wastes being churned out – whether it is solid waste or chemical waste – lingered as the waste-generation grew by leaps and bounds due to new heights of consumerism.

The American brand of democracy in which public sentiments are greatly valued also helped articulated the general public's disdain for the accumulation of wastes. The NIMBY (Not In My Own Backyard) is the most common form articulation of this, but which, unfortunately, only shifts the problem of dealing with the hazardous or toxic wastes to some other people or nations.

THE PUSH AND PULL IN HAZARDOUS WASTES TRADE

The 1970s-1980s is the height of public concern about hazardous waste in the US and elsewhere.[5] The nation wherein immense wealth has been made from the production and consumption of goods – approximately US$ 5-6 Trillion[6] in inflation-adjusted GDP or Gross

[4]National Historic Chemical Landmarks, available at http://acswebcontent.acs.org/landmarks/polymer/staudinger.html, last accessed 31 July 2013

[5]Andrews, A., Beyond the Ban – Can the Basel Convention adequately Safeguard the Interests of the World's Poor in the International Trade of Hazardous Waste?, Law, Environment and Development Journal (2009)
Available at http://www.lead-journal.org/content/09167.pdf
Last accessed 31 July 2013

[6]US Bureau of Economic Analysis, National Economic Accounts, available at http://www.bea.gov/national/index.htm#gdp, last accessed 31 July 2013

Domestic Product terms, is churning out large volumes of waste, the mere presence and disposal of which, can have a far ranging adverse effects on the American population and the US ecological resources on a wide scale.

It was during this period of increased awareness in the negative impacts of hazardous waste on human health and the environment that saw the proliferation of legislations relating to waste disposal in the domestic legal regimes of developed or rich countries.[7] Two of these major legal regimes governing hazardous waste disposal in the United States are the Resource Conservation and Recovery Act (RCRA) of 1976 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980.

RCRA provided waste disposal regulations in the United States that are so lengthy and time-consuming that it has been described, by the US courts no less, as "mind-numbing."[8] This is because RCRA includes a score of enforcement mechanisms and citizens' suit provisions applicable to domestic waste disposal activities, which thus increased the difficulties associated with waste disposal in the United States.[9]

The result is a decrease in the availability of disposal sites and a corresponding increase in disposal costs. This scarcity of waste disposal sites and the increasing cost of disposal provided the economic incentive for companies to export their waste. In a span of four years, from 1984 to 1988, the number of available disposal sites in the US decreased from 1,500 to only 325 sites. [10] Consequently, cost of burying a ton of waste exponentially rose to $200 from as little as $2.50 prior to the enactment of RCRA, while the $50 cost of burning such wastes spiraled to $2,000. [11] On the other hand, in developing countries such as those in the African continent, waste disposal costs for land filling are as little as $2.50 per ton of hazardous waste. [12]Exporting hazardous wastes to countries outside the United States therefore became a way of circumventing the RCRA and made so much business sense.

CERCLA meanwhile added more incentives to dispose of hazardous wastes outside of the United States' jurisdiction due to its fearsome joint and several liability regime which is so severe (collection from guilty companies easily amounted to $40 Million just in its first five years of implementation)[13], but which is inapplicable if the waste release occurs in foreign countries, even if the release resulted from a hazardous substance exported from the United

[7] *Ibid.*
[8] Webster-Main, A., Keeping Africa Out of the Global Backyard: A Comparative Study of the Basel and Bamako Conventions, 26 Environs 65 (2002)
[9] *Ibid.*
[10] Okaru, V., The Basel Concentration: Controlling the Movement of Hazardous Wastes to Developing Countries, 4 Fordham Environmental Law Review 137 (2011)
[11] *Ibid.*
[12] *Ibid.*
[13] *Supra* note 8

States. For this reason, a generator of waste in the US would readily decide to just export wastes, so as to reduce litigation concerns and possibility of paying hefty liabilities.

The situation is not much different is Europe. In the United Kingdom for example, the Confederation of British Industry estimated an increase of 150% in landfill costs from 1985 to 1991. [14] Costs of incineration have risen even more dramatically as more and more hazardous wastes are diverted from landfills to incinerators.[15] The price of incinerating a ton of hazardous wastes in the UK can be as high as US$10,000.[16] Some more countries in Europe that lead in industrial production and consumption also export their hazardous wastes to developing countries owing to a contribution of economic, geographic and geological factors. Denmark, Greece, and Luxembourg for instance, which are all industrialized countries, are prevented from building large disposal facilities or complex waste disposal sites since their land areas are too small and their volume of hazardous wastes are so considerable that such complex facilities are economically inefficient.[17] While in the case of Netherlands its hydrological and geological conditions (including high water table), necessitates the banning of landfill. [18]

It is clear that in seeking to protect their territories from the wastes brought about by their industrial production and consumption through stringent wastes regulations, the industrialized nations in effect provided the economic incentive to export hazardous waste to countries in the developing world.

These developing countries, which usually have little or no effective regulations of their own for management and disposal of wastes, also lacks the technical expertise to monitor and control the wastes imported into their countries and to determine the toxicity of such wastes. In addition, developing countries where the hazardous wastes ends up also lack the infrastructure and technology needed to cope with the treatment and disposal of wastes and have too many of their own hazardous waste problems to be able to cope with importing wastes from other countries. But in spite of all these shortcomings and apparent lack of capacity in handling the hazardous wastes imports, the opportunity of earning foreign currencies can still be a sufficient motivation on account of the fact that developing countries are also commonly saddled with foreign debts, not to mention widespread poverty. In1988 for example, some European and American waste brokers offered the Republic of Guinea-Bissau, a tiny country in West Africa, US $600 Million to import 15 million tons of industrial waste over a five year period – a potential earning that is

[14]Puckett, J., (1997), The Basel Ban: A Triumph Over Business-As-Usual.
Available at http://ban.org/about_basel_ban/jims_article.html
Last accessed 31 July 2013

[15]*Ibid.*

[16]*Ibid.*

[17]*Supra* note 10

[18]*Ibid.*

more than 35 times the annual export earnings of Guinea-Bissau. [19] Many other such arrangements were reported in the 1980's in other African countries such as Namibia, Guinea, Haiti and Sierra Leone.[20] In some cases dumping had taken place with the consent of the government in question, in other cases it was part of an illegal operation.[21]

[19]Lipman, Z., Trade in Hazardous Waste: Environmental Justice versus Economic Growth Environmental Justice and Legal Process.
Available at http://ban.org/library/lipman.html
Last accessed 31 July 2013

[20]*Ibid.*

[21]*Ibid.*

THE EMERGENCE OF THE BASEL CONVENTION

International concern surrounding the environmental problems caused by transboundary movements of hazardous wastes, particularly movement from a developed country to a poor country, already existed in the mid 1980s, and was intensified by several high profile cases highlighting the serious mismanagement and illegal movements of hazardous wastes in that decade. One of the most notorious cases was the Khian Sea, a ship with a cargo of 15,000 tons of incinerator ash from Pennsylvania, USA which was refused entry to its usual dumping site at New Jersey and thus sailed at sea from 1984-1986, stopping at various Caribbean ports but failing to offload its cargo, before finally leaving some of its wastes cargo in Haiti, with the rest assumed to have been dumped at sea. [22]

Another highly publicised case was the Koko Beach incident in 1987 wherein an Italian businessman, acting on behalf an Italian waste disposal company, illegally exported 800 drums containing 8 million pounds of exposed industrial and nuclear wastes (polychlormated biphenyls) from Italy to Nigeria over an 18-month period. [23] The Italian businessman brought the chemical waste to a Nigeria by mislabelling it as fertilizers, and deceived a retired/illiterate Nigerian timber worker into agreeing to store the chemical wastes in his backyard at the Nigerian river port of Koko for as little as $100 a month, while he made a profit of US$4.3 million. [24] The toxic chemicals were exposed to the hot sun and to children playing nearby and eventually leaked into the Koko water system resulting in the death of 19 villagers who ate contaminated rice from a nearby farm. [25] Some of the drums were dumped by residents and used to store drinking water, not knowing of the containers' highly poisonous content.[26] The waste that plagued the local population resulted to chemical bums among the resident, as well as paralysis, premature as birth. [27]

The public outcry that followed and the international campaign, led by environmental NGOs such as Greenpeace, to ban the international trade in hazardous waste prompted the United Nations Environmental Programme (UNEP) to sponsor negotiations for a treaty aimed at

[22]Organization for Economic Co-operation and Development (OECD), T*rade Measures in the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.* COM/ENV/TD97(41)/FINAL (May 27, 1998)
Available at http://www.oecd.org/trade/envtrade/36789048.pdf
Last accessed on 31 July 2013

[23]*Ibid.*

[24]Supra note 10

[25]*Ibid.*

[26]*Ibid.*

[27]*Ibid.*

regulating the hazardous waste trade beginning 1987.[28] The series of negotiations and various working group sessions culminated in a UNEP Conference held at the City of Basel, Switzerland and concluded with the unanimous adoption of the **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (or simply "Basel Convention**") by 116 states on 22 March 1989. The Convention entered into force on 5 May 1992 upon the attainment of the required number ratification, and as of May 2013 there are already 180 state parties to it .[29]

SCOPE OF THE CONVENTION: WHAT ARE HAZARDOUS WASTES?

The Basel Convention is the first global regulatory regime imposed upon the international or transboundary trade, both legal and illegal, of hazardous solid and chemical wastes. But what exactly are hazardous wastes under the Convention?

At the outset, the use of the word "control" in the Convention's title -- rather than prevention or prohibition -- is already telling of the breadth of regulation.[30] During the negotiations leading up to the Basel Convention, the vast majority of nations made it clear that they wanted to ban waste trafficking entirely, particularly from developed to developing countries.[31] Certain heavily industrialized countries, however, most notably the United Sates, fought to reject any such prohibition.[32]

The Convention achieved a compromise between these two positions by regulating rather than prohibiting trade in hazardous waste. This is first and foremost done by having a flexible, if not circuitous, definition of waste. According to the Basel Convention, wastes "*are substances or objects which are disposed of or are intended to be disposed of OR are required to be disposed of by the provisions of national law*".

Firstly, the "**hazardous wastes**" which are the subject of transboundary movement restrictions under the Convention are those wastes which by their composition or origin are hazardous.[33] The Basel Convention actually relies on the characteristics of the wastes – such as the fact of being corrosive, flammable, poisonous, infectious, oxidizing, etc. of the waste – in

[28] *Ibid.*

[29] United Nations Treaty Collection, available at http://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-3&chapter=27&lang=en, last accessed 31 July 2013

[30] *Supra* note 14

[31] *Ibid.*

[32] *Ibid.*

[33] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 22 March 1989, Annex VIII

ascertaining the waste is hazardous or not. But since the characteristics of a waste are generally determined by its composition or origin, the Convention makes composition or origin as the primary basis of determining what are hazardous waste.

Under Article VIII of the Convention, as amended, four broad classes of origin or composition of wastes have been deemed to ipso facto make as hazardous. These are:

Code (A1010-A1190)	A1 **Metal and Metal-Bearing Wastes**
Code (A2010-A2060)	A2 **Wastes Containing Principally Inorganic Constituents, which may contain metals and organic materials**
Code (A3010-A3200)	A3 **Wastes Containing Principally Organic Constituents, which may contain metals and inorganic materials**
Code (A4010-A4160)	A4 **Wastes Which May Contain Either Inorganic or Organic Constituents**
(for please see Annex for detailed listing)	

In simple terms, wastes, which by their origin or composition are classified into any of the four broad classes abovementioned are considered as *hazardous waste by default.*

However, if it can be proven that even if the waste falls under any of the four broad classes of origin or composition that makes it hazardous waste by default, it doesn't possess any of the following characteristics under Annex III of the Convention –

Code	Characteristics
H1	Explosive
H3	Flammable liquids
H4.1	Flammable solids
H4.2	Substances or wastes liable to spontaneous combustion
H4.3	Substances or wastes which, in contact with water emit flammable gases
H5.1	Oxidizing
H5.2	Organic Peroxides
H6.1	Poisonous (Acute)
H6.2	Infectious substances
H8	Corrosives
H10	Liberation of toxic gases in contact withair or water
H11	Toxic (delayed or chronic)
H12	Ecotoxic
H13	Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above.

then the waste is not hazardous waste, and therefore not subject of the restriction on transboundary movement .

Secondly, the "**hazardous wastes**" which are the subject of transboundary movement restrictions under the Convention are those wastes which, though not classified as "hazardous waste" under any of the provisions of the Basel Convention, are considered as *hazardous waste under the domestic legislation.*[34]

In the Philippines, the national legislations that deal with wastes are the Toxic Substances and Hazardous Wastes Management Act (Republic Act No. 6969) and the Ecological Solid Waste Management Act (Republic Act No. 9003).

Thirdly, the "**hazardous wastes**" which are the subject of transboundary movement restrictions under the Convention are those which are classified as "other wastes"[35] under Annex II of the Basel Convention. Article II provides for the following classifications:

Code	Waste Requiring Special Consideration
Y46	Wastes collected from households
Y47	Residues arising from the incineration of household wastes

FRAMEWORK OF THE CONVENTION: ENVIRONMENTALLY SOUND MANAGEMENT

When the Basel Convention was adopted in 1989, Article 4[36] thereof provided that state parties may or may not allow the transboundary movement of hazardous wastes, provided that if ever they do the importing or receiving countries must ensure conduct the transportation, disposal or management of hazardous waste in an "environmentally sound manner". With regard to the standards to be applied in ensuring that such wastes are managed in an environmentally sound manner, the Convention defines environmentally sound management of

[34] *Ibid.* Article 1 1(b)

[35] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 22 March 1989, Annex II

[36] Article 4 (2) Each Party shall take appropriate measures to:
[e] Not allow the export of hazardous wastes or other wastes to a State or group of States belonging to an economic and/or political integration organization that are Parties, particularly developing countries, which have prohibited by their legislation all imports, or if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner, according to criteria to be decided on by the Parties at their first meeting;

hazardous wastes as *“taking all practical steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes”.*

With regards to the exporting or sending countries, the Basel Convention allows the transboundary movement of hazardous waste if such is carried out in accordance with the Convention’s regulatory regime of “prior informed consent or PIC”.[37] Exporters must notify receiving countries of intended hazardous waste shipments. The notification must specify all the countries through which the waste will travel. The receiving nation has a number of options: it may accept the offer, reject it, solicit additional information, or accept the request with stipulated conditions. In any case, the exporting nation must not ship the waste until it gets consent and a disposal contract that provides for environmentally sound management of the wastes.

A state party may not import or export wastes with non-party states unless a separate agreement that satisfies the environmentally sound management standard has been established. A violation of any of these provisions requires the exporting State to recover its wastes from the receiving country.[38]

Over the past 20 years, there had been a large body of technical guidelines on the management of specific waste streams has been developed by technical government expert groups and approved by the Basel COP.[39] In 2002, COP 6 adopted the Strategic Plan for the implementation of the Basel Convention for the period 2002 to 2010, to assist developing countries and countries with economies in transition in implementing the provisions of the Convention. Numerous national and regional capacity building and training projects have since

[37]Article 4 (1) [c] Parties shall prohibit or shall not permit the export of hazardous wastes and other wastes if the State of import does not consent in writing to the specific import, in the case where that State of import has not prohibited the import of such wastes.

[38]Article 9 (2) In case of a transboundary movement of hazardous wastes or other wastes deemed to be illegal traffic as the result of conduct on the part of the exporter or generator, the State of export shall ensure that the wastes in question are:
(a) taken back by the exporter or the generator or, if necessary, by itself into the State of export, or, if impracticable,
(b) are otherwise disposed of in accordance with the provisions of this Convention, within 30 days from the time the State of export has been informed about the illegal traffic or such other period of time as States concerned may agree.
To this end the Parties concerned shall not oppose, hinder or prevent the return of those wastes to the State of export.

[39]Peiry, Katharina Kummer, Introduction, Basel Convention; Text and Annexes (2011), available at http://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf, last accessed 26 July 2013

been implemented under the umbrella of the Strategic Plan, with the assistance of the Secretariat and the Basel Convention Regional Centres. [40]

COP 6 also established a partnership programme with business and industry wherein two public-private partnerships have thus far been successfully launched, both with the objective of developing specific technical guidelines – to be used by the relevant industry and authorities for the management of end-of-life electronic devices and electronic waste – and initiating relevant pilot projects at country level, including in companies.[41] Between 2003 and 2008, the Mobile Phone Partnership Initiative (MPPI) developed guidelines for every stage of the management of end-of-life mobile phones, which are being used in relevant facilities.[42] 2008 saw the inception of the Partnership for Action on Computing Equipment (PACE) by COP 9, which is presently working to increase the environmentally sound management of used and end-of-life computing equipment. [43]

Recently, the management of hazardous chemicals and wastes has moved up on the international political agenda in the context of environmental governance, due, to no small part, to what has become known as the "synergies" process between the Basel Convention, Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade and the Stockholm Convention on Persistent Organic Pollutants. Several years of deliberations through a Party-led process culminated in the successful simultaneous extraordinary meetings of the Conferences of the Parties to the Basel, Rotterdam and Stockholm[44] Conventions (ExCOPs), which took place in last 2010 – a first in the history of international treaties and the highlight of the synergies process thus far, the ExCOPs gave directions for countries to implement the three conventions in a more holistic and coordinated way. [45]

BILATERAL, MULTILATERAL AND REGIONAL AGREEMENTS

Article 11 of the Basel Convention permits agreements or arrangements regarding the transboundary movement of hazardous wastes with Parties or non-Parties, provided that such

[40] *Ibid.*
[41] *Ibid.*
[42] *Ibid.*
[43] *Ibid.*
[44] Stockholm Convention on Persistent Organic Pollutants
[45] Supra note 39
[46] Article 11 (1)
Notwithstanding the provisions of Article 4 paragraph 5, Parties may enter into bilateral, multilateral, or regional agreements or arrangements regarding transboundary movement of hazardous wastes or other wastes with Parties or non-Parties provided that such agreements or arrangements do not derogate from the environmentally sound management of hazardous wastes and other wastes as required by this Convention. These agreements or arrangements shall stipulate provisions which are not less environmentally sound than those provided for by this Convention in particular taking into account the interests of developing countries.

agreements do not derogate from the environmentally sound management of waste as required by the Basel Convention, taking into account the interests of developing countries.

This provision has been criticized for being a way of circumventing the Convention since it is unclear whether a narrow or broad interpretation of "environmentally sound manner" should apply.[47] Under a narrow interpretation, an agreement will meet this criterion if it includes a requirement of environmentally sound management derived from the definition in the Basel Convention.[48] This definition is very general and is likely to impose few restrictions on states who wish to use Article 11 arrangements to conduct transboundary trade in hazardous waste.[49]

Japan, an industrialized country with a rapidly aging population, a shrinking and expensive labor force, a very high cost of living, hunger for resources to feed its industrial base, and diminishing space to dispose of wastes, has exploited such provision of the Convention in outsourcing of hazardous waste management (along with the waste) to poorer countries in East and South Asia . Japan has found it easier to lure Asian developing countries outside of the safety of the multilateral context of the Basel Convention, into signing bilateral trade agreements. In bilateral accords between unequal economic partners, instead of pooling the collective political clout of developing nations, nations are reduced to a one-on-one standoff, where Japan enjoys what some declare as predatory weight and influence from its economic dominance.

The Japan-Philippines Economic Partnership Agreement (JPEPA) can be considered to be one such bilateral agreement because even it is essentially an omnibus free trade agreement, with some of the provisions therein pertaining to the transboundary movement of hazardous wastes.

Under the JPEPA, not only are certain identified wastes allowed to be transported into the Philippines, but that the importations of these wastes to the Philippines are granted zero percent preferential tariffs. These wastes are the following:

Table 1. Tariff Elimination on Waste Imports from Japan under the JPEPA

TARIFF HEADING NO.	DESCRIPTION (Waste Imports from Japan to the Philippines)	MFN RATE	JPEPA TARIFF RATE
2620.6000	Ash and residues (other than from the manufacture of iron or steel), containing arsenic, mercury, thallium or their mixtures, of a kind used for the extraction of arsenic or those metals or for the manufacture of their chemical compounds	3%	0%
2621.1000	Ash and residues from the incineration of municipal waste	3%	0%
3006.80 (3006.8010, 3006.8090)	Waste pharmaceuticals	20%	0%

[47] *Supra* note 19
[48] *Ibid.*
[49] *Ibid.*
[50] Basel Action Network (BAN) (2011), Building Toxic Waste Colonies: Japan's Economic Partnership Agreements, Available at http://www.ban.org/wp-content/uploads/2013/04/BP9_April_2013_Final_Letter.pdf Last accessed 31 July 2013
[51] *Ibid.*

38.25 (and its subheadings)	Residual products of the chemical or allied industries, not elsewhere specified or included; municipal waste; sewage sludge; other wastes specified in Note 6 to this Chapter	30%	0%
3825.1000	Municipal waste	30%	0%
3825.2000	Sewage sludge	30%	0%
3825.3010	Clinical waste — adhesive dressings and other articles having adhesive layer; wadding gauze bandages, surgical gloves	30%	0%
3825.3090	Other clinical waste	30%	0%
3825.4100, 3825.4900	Waste organic solvents — halogenated, and other	30%	0%
3825.6100, 2825.6900	Other wastes from other chemical or allied industries — containing organic constituents, other	30%	0%
3825.5000	Wastes of metal pickling liquors, hydraulic fluids, brake fluids and anti-freeze fluids	30%	0%
6309.00	Worn clothing and other worn articles	Prohibited importation under RA 4653	0%
6310.00	Used or new rags, scrap twine, cordage, rope and cables and worn out articles of twine, cordage, rope or cables, of textile materials	Prohibited importation under RA 4653	0%

Source: Philippine Center for Investigative Journalism, JPEPA to Encourage Trade in Hazardous and Toxic Waste, available at http://pcij.org/blog/2006/10/25/jpepa-to-encourage-trade-in-hazardous-and-toxic-waste, last accessed 31 July 2013

The JPEPA was ratified by the Philippine Senate on October 2008, in spite of strong oppositions from some civil society groups. An Exchange of Diplomatic Notes was however executed between the Philippine and Japanese governments which contained Japan's promise not to export toxic wastes to the Philippines except in accordance with the Basel Convention. [52]

THE BASEL BAN AMENDMENT

A host of criticisms were raised against the regulatory framework of the Basel Convention, prompting the group of African countries to even adopt their own regional multilateral agreement, the Bamako Convention (on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes Within Africa) in 1991.[53] The African regional ban was followed by another regional agreement among six Central American countries banning the imports of hazardous wastes in to their respective territories in 1992.[54]

Critics of the Convention points out to the ambiguity created by the failure of the Conven-

[52] *Ibid.*
[53] *Supra* note 8
[54] *Ibid.*

manner of hazardous waste management, so the standard has often been subject to conjecture.[55] In addition, the concern about the Basel Convention's prior informed consent mechanism is that it became a mere paperwork regime and was not strong enough to withstand the economic clout of the waste trade.[56] Such a regime was easily manipulated, corrupted, and circumvented.

Rather than being "controlled" by the Basel Convention, the observable waste trade simply shifted targets and pretext, but kept flowing. [57] Waste traders were quick to move the wastes to those areas of the world where no bans existed, and, most significantly, they were quick to categorize all waste bound for export as destined for "recycling" and not dumping thus ostensibly passing the environmentally sound manner criterion. [58]

Waste traders were quick to embrace the "green" term recycling. This rhetorical make-over was particularly prudent because a trade characterized as "recycling" more closely fit the definition of waste being a "good" or a commodity and thus one subject to free trade. [59] Furthermore, it was very easy to design a "further use" and thus a form of "recycling" for virtually any waste no matter how noxious, particularly in the context of needy developing countries. [60]

Indeed, the percentage of total waste trade schemes that claimed a fate or pretext of recycling increased first dramatically and then steadily, according to Greenpeace records.[61] From 1980 to 1988, only 36% of the schemes where the destination was reported claimed a further-use destination. [62] By 1989 this has risen to 76%. In 1990 it was 83%, in 1991 it was 87%, in 1992 it was 88% and in 1993 it had risen to 89%.[63]

Owing to these developments, a landmark amendment (Decision III/1) was proposed and adopted during the Convention's 3rd Conference of Party (COP) held at Geneva, Switzerland on September 1995. This was achieved by inserting a new **Article 4A** into the Convention and creating a new

[55]*Supra* note 10
[56]*Supra* note 14
[57]*Ibid.*
[58]*Ibid.*
[59]*Ibid.*
[60]*Ibid.*
[61]*Ibid.*
[62]*Ibid.*
[63]Figures tabulated from Vallette, J. and Spalding, H., *The International Trade in Wastes: A Greenpeace Inventory, International Waste Trade Schemes and Related International Policies,* Fifth Edition, Greenpeace 1990.

'1. Each Party listed in Annex VII shall prohibit all transboundary movements of hazardous wastes which are destined for operations according to Annex IV A [final disposal], to States not listed in Annex VII.

2. Each Party listed in Annex VII shall phase out by 31 December 1997, and prohibit as of that date, all transboundary movements of hazardous wastes under Article 1(i)(a) of the Basel Convention which are destined for operations according to Annex B [recovery and recycling] to States not listed in Annex VII. Such transboundary movement shall not be prohibited unless the wastes in question are characterised as hazardous under the Basel Convention.'

The Annex VII mentioned above comprised of Parties and other States which are:

i. members of the Organization for Economic Cooperation and Development (OECD)
ii. members the European Community (EC) [now known as European Union or EU], and
iii. Liechtenstein

The basic idea with the Basel Ban Amendment is the absolute prohibition of transboundary movement of hazardous wastes from the industrialized or rich countries to the poor or developing countries. This is because the industrialized or rich countries are disproportionately responsible for the global hazardous waste generation and possess a disproportionately better capability (wealth) to address the matter at their own territories.[64]

But due to the possible vagueness of the terminology "industrialized countries" it was not used in the language of the Amendment, and in order to achieve clarity as to which countries were to be prohibited from exporting hazardous wastes to developing countries, the OECD and EC/EU classification was utilized instead. Meanwhile, Liechtenstein, a tiny country in Central Europe that has no border control and shares a customs union with Switzerland, was specifically included in Annex VII since it is neither an OECD nor an EC/EU member but due to its geopolitical circumstance its non-inclusion in Annex VII could represent a possible loophole for hazardous waste exports from the OECD and EC/EU countries.[65]

For the Basel Ban Amendment to come into force, it is however required three-fourths (3/4) of the "Parties having accepted them" must ratify the Amendment. For some time there was a dispute as to what 3/4 of the parties means – 3/4 of the 116 States that adopted the Convention in 1989 which is 87 OR 3/4 of the 82 States that adopted the Amendment to the

[64]Basel Action Network (BAN) (2008), Annex VII Expansion? – Say 'No' to Attempts to Undo Basel Ban, Available at http://www.eartheconomics.org/FileLibrary/file/Reports/Ban/BANBP03_June2008.pdf Last accessed 31 July 2013

[65]*Supra* note 19

Convention in 1995 which is 62[66]? Another view, advanced by the UN Office of Legal Affairs, provides that the basis of the 3/4 computation is the current number of membership of the Convention which presently stands at175,

THE COUNTRY-LED INITIATIVE

During the 2008 COP 9 of the Basel Convention at Bali, Indonesia, a process initiated by the governments of Indonesia and Switzerland, called Country-Led Initiative (CLI), was agreed upon with the primary objective of moving forward with the Ban Amendment.[67] In the years that followed the CLI conducted informal and dynamic consultation process with key stakeholders to formulate its proposal as to the number of ratifications needed.[68]

The CLI's recommendation, that the threshold for the Basel Ban Amendment to take effect is 62 county ratifications, was submitted for consideration during the 2011 COP 10 at Colombia.[69] The COP adopted the CLI's proposal, in spite of some statements by Japan representatives to the contrary, hence only 62 ratifications from among the 82 countries that adopted the Amendment in 1995 are required for the absolute ban on hazardous waste transboundary movement to take into effect. [70]

As of May 2013, 45 of the 82 countries that adopted the Ban Amendment have ratified it, thus only 17 more countries are needed for it to take effect.[71] The Philippines, which was present during the 1995 COP 3 wherein the Ban Amendment was adopted, and was in-fact co-chair of the negotiating block of developing countries known as G77 (Group of 77) at that time, is one such country whose ratification of the Basel Ban Amendment would move towards bringing the Ban Amendment into force.

[66]Basel Action Network (BAN) (2008), Basel Convention Ban Amendment – Entry into Force Country Analysis,
Available at http://ban.org/library/BanRatPartiesCOP9_CountryAnalysis.pdf
Last accessed 31 July 2013

[67]Rachmawaty, E., and Perrez, F., (2009), Presentation of the Context and the Concept of the CLI – First Meeting of the Indonesian-Swiss Country-Led Initiative on an Informal Process to Improve the Effectiveness of the Basel Convention, Bali, Indonesia 15-17 June 2009 [PowerPoint Slides]
Available at http://www.basel.int//cli//Bali_Presentation%201%20-%20Intro%20CLI
Last accessed 31 July 2013

[68]*Ibid.*

[69]Centre for International Environmental Law, Basel Convention COP10 Makes Great Progress on Regulation of Global Hazardous Waste Trade, available at http://www.ciel.org/HR_Envir/Basel_Shipbreaking_13Oct11.html, last accessed 31 July 2012

[70]*Ibid.*

[71]Supra note 29

Table 2. List of Basel Parties and Status of Ratification

	Parties at 1995 Basel COP	Status of Ban Amendment Ratification?
1.	Austria	Yes
2.	Belgium	Yes
3.	Chile	Yes
4.	China	Yes
5.	Cyprus	Yes
6.	Czech Republic	Yes
7.	Denmark	Yes
8.	Ecuador	Yes
9.	Egypt	Yes
10.	Estonia	Yes
11.	European Union	Yes
12.	Finland	Yes
13.	France	Yes
14.	Germany	Yes
15.	Hungary	Yes
16.	Indonesia	Yes
17.	Jordan	Yes
18.	Kuwait	Yes
19.	Latvia	Yes
20.	Liechtenstein	Yes
21.	Luxembourg	Yes
22.	Malaysia	Yes
23.	Mauritius	Yes
24.	Netherlands	Yes
25.	Nigeria	Yes
26.	Norway	Yes
27.	Oman	Yes
28.	Panama	Yes
29.	Poland	Yes
30.	Portugal	Yes
31.	Qatar	Yes
32.	Romania	Yes
33.	Saint Lucia	Yes
34.	Slovak Republic	Yes
35.	Slovenia	Yes

36.	Spain	Yes
37.	Sri Lanka	Yes
38.	Sweden	Yes
39.	Switzerland	Yes
40.	Syria	Yes
41.	Trinidad and Tobago	Yes
42.	Turkey	Yes
43.	United Kingdom	Yes
44.	Tanzania	Yes
45.	Uruguay	Yes

Ratification by17 of the ff. 37 Countries will bring the Ban into Legal Effect

46.	Antigua and Barbuda	No
47.	Argentina	No
48.	Australia	No
49.	Bahamas	No
50.	Bangladesh	No
51.	Brazil	No
52.	Canada	No
53.	Costa Rica	No
54.	Cote d'Ivoire	No
55.	Croatia	No
56.	Cuba	No
57.	El Salvador	No
58.	Greece	No
59.	Guatemala	No
60.	Iceland	No
61.	India	No
62.	Iran	No
63.	Ireland	No
64.	Israel	No
65.	Italy	No
66.	Japan	No
67.	Lebanon	No
68.	Malawi	No
69.	Mexico	No
70.	Namibia	No

71.	New Zealand	No
72.	Pakistan	No
73.	Peru	No
74.	Philippines	No
75.	Korea	No
76.	Russia	No
77.	Saudi Arabia	No
78.	Senegal	No
79.	Seychelles	No
80.	South Africa	No
81.	Vietnam	No

THE PHILIPPINE RESPONSE TO HAZARDOUS WASTE TRADE

The Philippines has been a Party to the Basel Convention since October 1993. It has not yet, however, ratified the Ban Amendment (Decision III/1) to the Convention.

TOXIC SUBSTANCES AND HAZARDOUS WASTE ACT

As early as 1990, a year after the Basel Convention was adopted the Philippine government promulgated Republic Act No. 6969[72] or the Toxic Substances and Hazardous and Nuclear Waste Control Act in order --

i. 'to regulate, restrict or prohibit the importation, manufacture, processing, sale, distribution, use and disposal of chemical substances and mixtures that present unreasonable risk and/or injury to health or the environment;
ii. to prohibit the entry, even in transit, of hazardous and nuclear wastes and their disposal into the Philippine territorial limits for whatever purpose; and
iii. to provide advancement and facilitate research and studies on toxic chemicals.'[73]

This is in line with Article 3 of the Convention which requires state parties to put further national policies for hazardous waste management. Under RA 6969 a national definition of the term hazardous waste for the purpose of transboundary movements of waste was adopted.

"Hazardous waste" is defined under Republic Act 6969 as:

> *(…) substances that are without any safe commercial, industrial, agricultural, or economic usage and are shipped, transported, or brought from the country of origin for dumping or disposal into or in transit through any part of the territory of the Philippines.*
>
> *It shall also refer to by-products, side-products, process residues, spent reaction media, contaminated plant or equipment or other substances from manufacturing operations and as consumer discards of manufactures products which present unreasonable risk and/or injury to health and safety to the environment.*[74]

[72] An Act to Control Toxic Substances and Hazardous and Nuclear Wastes, Providing Penalties for Violations Thereof, and for Other Purposes
[73] RA 6969, Section 2. Declaration of Policy
[74] RA 6969, Section 5(g)

Meanwhile, RA 6969 defines "hazardous materials" as substances that may have

> *short-term acute hazards such as acute toxicity by ingestion, inhalation or skin absorption, corrosivity or other skin or eye contact hazard or the risk of fire or explosion; or long-term environmental hazards, including chronic toxicity upon repeated exposure, carcinogenicity (which may in some case result from acute exposure but with a long latent period), resistance to detoxification process such as biodegradation, the potential to pollute underground or surface waters, or aesthetically objectionable properties such as offensive odors.*

RA 6969 further identifies several categories of hazardous materials. The table below summarizes these waste categories.

Table 3. Classification of Hazardous Wastes (RA 6969)

Class	Description
A – Wastes with Cyanide	Wastes containing cyanide at a concentration greater than 200ppm in liquid waste
B – Acid Wastes	Acid wastes such as hydrochloric, hydrofluoric, nitric, phosphoric, sulfuric and others that have a pH of 2 or less
C – Alkali Wastes	Alkali wastes such as caustic soda, potash, alkaline cleaners, ammonium hydroxide, lime slurries, and other alkali wastes that have a pH of 12.5 or more
D – Inorganic Chemicals	Wastes with inorganic chemicals (selenium, arsenic, barium, cadmium, chromium, lead, mercury, their compounds, and other inorganic compounds)
E – Reactive Chemicals	Oxidizing agents, reducing agents, explosive and unstable chemicals, and highly reactive chemicals
F – Inks / Dyes / Pigments / Paint / Latex / Adhesives / Organic / Sludge	Solvent or aqueous based, ink formulations, inorganic pigments
G – Waste Inorganic Solvents	Halogenated or non-halogenated
H – Putrescible Wastes	Animal/abattoir wastes, grease trap wastes (from commercial and industrial)
I – Waste Oils	Includes all wastes from establishments that generate, transport or treat more than 200 L of waste oil per day except vegetable oil and waste tallow
J - Containers	containers that previously contained toxic chemical substances
K – Immobilized Wastes	solidified or polymerized, encapsulated, or chemically fixed
L – Organic Chemicals	Wastes with specific non-halogenated toxic organic chemicals, ozone depleting substances, PCB wastes
M - Miscellaneous	pathogenic, infectious, friable asbestos, pharmaceuticals/drugs, pesticides, or persistent organic pollutant pesticides

The Implementing Rules and Regulations (IRR) of RA 6969 is Department of Environment and Natural Resources (DENR) Administrative Order No. 29-92 which prohibited the importation of hazardous and other wastes for final disposal. There were other Administrative Orders issued by the DENR, notably DAO Nos. 27, 28, and 66, which all basically pertain to the

[75] RA 6969, Section 5(f)

prohibition of transboundary movements of all wastes, even for recovery, from all countries and regions.

However, an exception is granted to the importation of materials containing indicated substances for the control of importation of wastes, for recovery, recycling and reprocessing, which may be done by obtaining prior written approval from the Secretary of the Department of Environment and Natural Resources or a his legally appointed representative.

In 1994, the Department of Environment and Natural Resources (DENR) released Administrative Order No. 28 on the Interim Guidelines for the Importation of Recyclable Materials Containing Hazardous Substances. While it reiterates that no hazardous wastes (as defined in the Implementing Rules and Regulations of RA 6969) will be allowed into the country, it provides for the importation of wastes for "recovery, recycling and reprocessing" upon approval of the DENR. This then allows for the importation of the following waste materials:

- i. scrap metals (including used lead-acid batteries and metal bearing sludge)
- ii. solid plastic materials
- iii. electronic assemblies and scraps

As s result of this entry point importation of some classes of wastes, surplus shops selling used appliances and other electronic items from other countries sprouted in Metro Manila and other areas in the Philippines.

Figure 1. Electronics Surplus Shops at Roadside of Port Area in Manila

Photo Credit: Carisma (2009)

In 2004, the DENR issued DAO No. 04-36 which is a Procedural Manual for Hazardous Waste Management. The hazardous waste management requirements and procedure can be broadly summarized in the following guise:

Table 4. Procedural Manual for Hazardous Waste Management

I.	**Classification of Hazardous Waste (see Table 1)**
II.	**Waste Generators**
	a. Determination if Wastes are Hazardous Waste
	b. Registration as Wastes Generator
	c. Submission of Quarterly Hazardous Waste Generator Reports
	d. Responsibility for Storage and Labelling of Wastes
	e. Submission of Contingency or Emergency Plan
	f. Conduct of Personnel Training
III.	**Waste Transporter**
	a. Registration and Accreditation
	b. Issuance of Transport Permit
IV.	**Waste Transport Record**
	a. Generator Information
	b. Transporter Information
	c. Treatment, Storage and Disposal (TSD) Information
V.	**Hazardous Waste Storage and Labelling**
	a. Minimum Requirement for Hazardous Waste Storage Facilities
	b. Labelling Requirements
	c. Packaging Requirements
VI.	**Waste Treatment and Disposal Premises**
	a. Requirements for setting up TSD Facilities
	b. TSD Facility Registration
	c. Waste Acceptance Requirements
VII.	**Import and Export of Hazardous Substances**
	a. Requirements for Importers of Hazardous Waste
	b. Requirements for Exporters of Hazardous Waste

Derived from: Sañez, G. (2010). E-Waste Management in the Philippines – Regional Workshop on E-waste management. Osaka, Japan, 6-9 July 2010 [PowerPoint Slides]
Available at http://www.unep.or.jp/ietc/spc/news-jul10/Philippines_(Mr.Geri).pdf
Last accessed 31 July 2013

SOLID WASTE MANAGEMENT ACT

For the overall framework for managing waste, RA 9003 or the Ecological Solid Waste Management Act was enacted in 2001 to cover all forms of solid waste. RA 9003 sets targets

[76] An Act Providing for an Ecological Solid Waste Management Program, Creating the Necessary Institutional Mechanisms and Incentives, Declaring Certain Acts Prohibited and Providing Penalties, Appropriating Funds Therefore, and for Other Purposes

and guidelines for managing solid waste through the 3R concept; reduce, reuse and recycling prior to collection, treatment and disposal.[77]

The enactment of this law requires waste segregation and recycling as the main strategies for dealing with waste and requires Local Government Units to divert 25% of their municipal waste into reuse, recycling, composting and recovery activities within the next 5 years from the enactment of the law and an increment increase thereof every year. [78] Amongst the important salient features of this law include creation of National Solid Waste Management Commission (NSWMC), mandatory segregation of solid waste, promotion of eco-labelling, and establishment of Materials Recovery facility in every barangay or cluster of barangays.[79]

RA 9003 defined "hazardous waste" in this manner:

> *(…) hazardous waste shall refer to solid waste management or combination of solid waste which because of its quantity, concentration or physical, chemical or infectious characteristics may:*
>
> *(1) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or*
>
> *(2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed*[80]

RA 9003 was however meant, primarily, to deal with the garbage problem. Nevertheless, it covers a sub-classification of hazardous solid wastes, i.e. household hazardous wastes, which it calls as "special waste". Included in the special wastes are the **consumer electronics** which at first glance are not seemingly hazardous.

Consumer electronics can include a wide variety of goods, such as computers, cellular phones, TVs, refrigerators, air conditioners, washing machines, radios and video cameras. Although these are considered safe during its useful life, the fact remains that among the components of consumer electronics are heavy metals, flame retardants, lead, beryllium, mercury, cadmium, chromium, and persistent organic pollutants (POPs)[81] which are all hazardous materials.

The potential for release of the hazardous constituents increases during storage or disposal or toward its end-of-life cycle when the packaging or protective casings of the equipment are torn

[77]Carisma, B., Drivers of and Barriers to E-waste Management in the Philippines (June 2009) (unpublished M.Sc. thesis, Lund University - University of Manchester - University of the Aegean - Central European University, Sweden)
Available at http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=1511085&fileOId=1511091
Last accessed 31 July 2013

[78]*Ibid.*

[79]*Ibid.*

[80]RA 9003, Sec. 3 (p)

[81]*Supra* note 71

off, broken or damaged.[82] At this condition or stage of the consumer electronics becomes what is popularly referred to as electronic waste – or simply '**e-waste**'.

Unfortunately, there is no legal framework or environmental regulation in the Philippines that directly targets e-waste as a special waste stream.[83] The country has existing laws that govern resource extraction and utilization and regulations on waste disposal to receiving environment (e.g. ambient and effluent standards) but not on the waste associated to products.[84] Even if the 3R (reduce, use, recycle) has been the identified strategy for waste reduction, it has never been legislated nor complied with by companies with mandatory recycling activities.[85]

Further, though 3R strategies are desirable in minimizing the amount of trash that ends up in landfills or waterways, great caution must be taken in order to ensure that this process doesn't get misuse for unscrupulous purposes. This happens, when for instance, used high-tech equipments from developed countries are sent to developing countries in the guise of being reuse and thus bridging the digital divide but actually ends up being discarded and picked apart by destitute scavengers who thereby face exposure to the toxic chemicals in the broken equipment.

[82] *Ibid.*
[83] *Ibid.*
[84] I*bid.*
[85] *Ibid.*

THE ECONOMICS OF HAZARDOUS WASTE TRADE: INDISPENSABLE OR NOT?

The economic incentives for exporting hazardous waste to developing countries are well-known. As the industrialized countries have become more aware of the dangers of hazardous waste disposal, more stringent environmental measures have been adopted resulting to high disposal cost. The situation in the United States wherein the cost of dumping toxic materials in landfills rose from $15 in 1980 to $250 in just a matter of eight years[86] due to the NIMBY syndrome and the passage of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, is illustrative of this.

On the other hand, developing countries can provide a disposal option at prices that are often a mere fraction of the equivalent cost in the state of origin. In the late 1980s for instance, in the former French colony of Benin in Western Africa, a sub-Saharan country which is dependent on subsistence farming, the government became so desperate in addressing its severe economic deficit which left it unable to pay its foreign debt that it agreed to be the dumping site of several millions of tons of radioactive and industrial wastes from France for a period of 30 years.[87] Benin was to receive a measly $1.6 Million in return for being made the dumping ground of its former colonial masters, which included a shipment of nuclear waste that was buried somewhere in Benin before intense media and civic opposition forced the French government to cancel the arrangement.[88] Such is a classic case of supply perfectly matching the demand; or better opportunism in the face of desperation.

EMPIRICAL ANALYSIS OF BASEL BAN AT GLOBAL LEVEL

The Basel Ban is also of particular interest to international economics and global trade as its possible enforcement may impede the flow of goods and services between and among nations.

In 2013, two senior economists from Georgetown University and the University of Montana, Dr. Arik Levinson and Dr. Derek Kellenberg, published a study entitled "Waste of Effort? International Environmental Agreements" that sought to empirically probe whether the Basel Convention and the Basel Ban Amendment are effective in attaining its primary goal of reducing and prohibiting the toxic trade.

[86]Sende, Martha, Toxic Terrorism: A Crisis in Global Waste Trading (2006), available at http://www.nyu.edu/pubs/anamesa/archive/spring_2010/Sende%20Toxic%20Terrorism.pdf, last accessed 25 January 2014

[87]*Ibid.*

[88]*Ibid.*

The study has since been subjected to peer review in workshops at the University of British Columbia, Swiss Federal Institute of Technology, University of Bologna, and at Stanford University.

The empirical analysis employed by the two economists is robust to say the least, but the study suffers from a flawed assumption – that the Ban "went into force for ratified countries in 1998" – which is misreading or misinterpretation of Convention. During the 1995 CoP, when the Basel Ban Amendment text (Article 4A) was approved for incorporation into the Convention it was indeed stated therein that after 31 December 1997, or beginning 1998 in other words, toxic trade from OECD/EU countries to non-OECD/non-EU countries shall be prohibited. That doesn't mean however that the Basel Ban is now in force because the Ban Amendment, or Article 4A, needs to be ratified first by a certain number of state parties for it to have legal force. Although there is nothing that prevents those countries that have ratified the Ban Amendment by 1998 from enforcing the Ban Amendment in their own dealings, any compliance therewith would only be voluntary on the part of those countries.

The fact remains that after 1998, and even until the present time 2014, the Basel Amendment is not for mandatory, legal compliance among the community of nations. Those countries that have ratified the Ban Amendment and choose to abide by it may have indeed restricted their toxic trade activities, but the regularity and seriousness of such compliance cannot be lightly assumed since one may readily deviate from a voluntary commitment.

Therefore, the conclusion of the Levinson-Kellenberg study that the "Ban seem to have had no effect on the growth of international hazardous waste shipments, and almost no effect on shipments from developed to developing countries" proceeds from a flawed assumption.

Nevertheless, the very same conclusion of the Levinson-Kellenberg study that the Ban is ineffective can serve as empirical basis to precisely argue for the ratification of 17 more countries of the Ban Amendment, which will finally pave the way for its entry into legal force. In this light, the methodology and empirical findings Levinson-Kellenberg was examined.

Harmonized System (HS) System of Tariff Codes as Close Proxy for Waste Trade

The Basel Convention requires members to report their hazardous waste imports and exports, but those data cannot be used to compare members to non-members, or to study members before and after signing the Convention. [89]

[89] Levinson, Arik, and Kellenberg, Derek, Waste of Effort? International Environmental Agreements (2014), available at http://www9.georgetown.edu/faculty/aml6/pdfs&zips/WasteofEffort.pdf, last accessed 28 February 2014

To address this problem, Levinson-Kellenberg developed a close proxy for the waste trade governed by Basel Convention from data culled from the **United Nations Commodity Trade Statistics Database (UN Comtrade)** which stores standardized official annual trade statistics reported by countries and reflecting international merchandise flows detailed by commodity and partner country with coverage reaching up to 99% of world merchandise trade.

Data were collected for all bilateral trading pairs of 124 countries with at least some positive quantity of trade from 1988 to 2008, with the main unit of observation being the aggregate annual tonnage of waste traded between countries, summed across 60 six-digit Harmonized System (HS6) tariff codes for which the product description lists "waste", "scrap", "slag", "residue", or "ash" as the primary descriptor of the product.[90] Each country pair potentially appears twice per year: once for each direction of waste flows.[91] In total, 46,149 observations were made.[92]

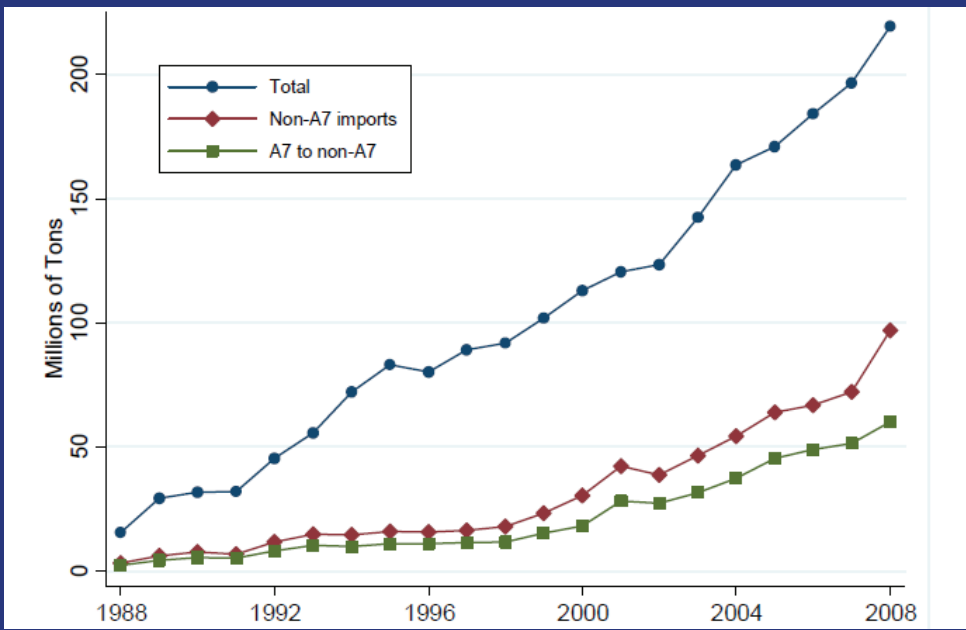
[90] *Ibid.*
[91] *Ibid.*
[92] *Ibid.*

The HS6 Tariff Codes Table looks like this –

HS6 Code	Commodity Description	HS6 Code	Commodity Description
230800	Vegetable mats./waste/residues/by-prods., whether or not in pellets	520210	Cotton yarn waste (including thread waste)
262011	Ash or residues containing hard zinc spelter	700100	Glass cullet, waste or scrap, glass in the mass
262019	Ash & residues, containing zinc other than hard zinc spelter	711210	Waste or scrap containing gold as sole precious metal
262020	Ash or residues containing mainly lead	711220	Waste/scrap containing platinum as sole precious metal
262030	Ash or residues containing mainly copper	711290	Waste/scrap, precious metals except pure gold/platinum
262040	Ash or residues containing mainly aluminium	720410	Waste & scrap of cast iron
262050	Ash or residues containing mainly vanadium	720421	Waste or scrap, of stainless steel
262100	Slag and ash nes, including seaweed ash (kelp)	720429	Waste & scrap of alloy steel other than stainless steel
262110	Ash & residues from the incineration of municipal waste	720430	Waste or scrap, of tinned iron or steel
262190	Slag & ash, other than from the incineration of municipal waste	720441	Waste from the mechanical working of iron or steel nes
382510	Municipal waste	720449	Ferrous waste or scrap, nes
382520	Sewage sludge	740400	Copper/copper alloy waste or scrap
382530	Clinical waste	750300	Nickel waste or scrap
382541	Halogenated waste organic solvents	760200	Aluminium waste & scrap
382549	Waste organic solvents other than halogenated waste organic solvents	780200	Lead waste & scrap
382550	Wastes of metal pickling liquors, hydraulic fluids, brake fluids & anti-freeze fluids	790200	Zinc waste & scrap
382561	Wastes from chemical/allied industries, mainly containing organic constituents, n.e.s.	800200	Tin waste & scrap
382569	Wastes from chemical/allied industries, n.e.s.	810197	Tungsten (wolfram) waste & scrap
382590	Residual products of the chemical/allied industries, n.e.s.	810297	Molybdenum waste & scrap
391510	Polyethylene waste or scrap	810330	Tantalum waste & scrap
391520	Polystyrene waste or scrap	810420	Magnesium waste & scrap
391530	Polyvinyl chloride waste or scrap	810530	Cobalt waste & scrap
391590	Plastics waste or scrap nes	810730	Cadmium waste & scrap
400400	Rubber waste, parings and scrap (except hard rubber)	810830	Titanium waste & scrap
440130	Sawdust, wood waste or scrap	810930	Zirconium waste & scrap
470620	Pulps of fibres derived from recovered (waste & scrap) paper/paperboard	811020	Antimony waste & scrap
470710	Waste or scrap of unbleached kraft or paperboard	811213	Beryllium waste & scrap
470720	Waste, scrap of paper, board of bleached chemical pulp	811222	Chromium waste & scrap
470730	Waste or scrap of paper or board of mechanical pulp	811252	Thallium waste & scrap
470790	Waste, scrap of paper, board, nes (including unsorted)	854810	Waste & scrap of primary cells, primary batteries & electric accumulators

With the HS6 Tariffs Code Table and the standardized data obtained over a period of 21 years from UN Comtrade, Levinson and Kellenberg then compared proxy to the actual voluntarily reported hazardous waste trade data collected under the auspices of the Basel Convention, for those countries that have ratified the Convention and for the years following their ratification.

Figure 2. Total Annual Waste Shipments (1998-2008)



Note: "A7" refers to the Annex VII Countries in the Basel Convention or the OECD/EU Countries or so-called developed nations, while "non-A7" refers to the non-OECD/non-EU countries or the so-called developing nations

The figure above shows that between 1988 and 2008, waste trade has grown by many multiples, and that waste imported into non-OECD/non-EU countries accounts for nearly half of that growth.[93] Notably, shipments from OECD/EU to non-OECD/non-EU countries – the shipments prohibited by the Ban – account for more than a quarter of the overall growth in waste trade. [94]

Notice however that beginning the year 2006, all the way to the year 2008, that while the shipments of toxic wastes from OECD/EU countries to non-OECD/non-EU countries is still on the rise, the importations or shipments of hazardous from non-OECD/non-EU countries to fellow non-OECD/ non-EU countries, and even to OECD/EU and non-Basel signatory countries, have sharply increased.

[93] *Ibid.*

[94] *Ibid.*

This seems to denote that while that are still shipments of wastes from the developed countries to the developing countries, the volume of waste coming from developing countries to their fellow developing countries, or from developing countries to developed countries, are increasing, and more importantly, outpacing the rate of waste shipments from the traditional developed to developing countries trade route.

A disaggregated look into the UN Comtrade proxy data seems to support this view.

Table 5. Hazardous Waste Shipped Among Countries

	All	A7 to A7	A7 to non-A7	Non-A7 to A7	Non-A7 to non-A7
	(1)	(2)	(3)	(4)	(5)
Total (million tons)	2,163	1,295	456	202	211
Annual country pairs	46,149	13,531	10,083	11,864	10,671
Average annual (tons)	46,865	95,670	45,178	17,001	19,775
(std. dev.)	(304,563)	(420,143)	(363,328)	(121,229)	(177,567)

Note: "A7" refers to the Annex VII Countries in the Basel Convention or the OECD/EU Countries or so-called developed
nations, while "non-A7" refers to the non-OECD/non-EU countries or the so-called developing nations

Source: Waste of Effort: International Environmental Agreements (2014)

The table above shows that from 1988 to 2008, 2.2 billion tons of waste was shipped among countries. More than half of this waste was shipped among A7countries (A7 toA7) totalling almost 1.3 billion tons. Shipments from A7 to non-A7 countries on the other hand, though making up the second largest component of waste trade is only about one-third, at 456 million tons, of the A7 to A7 waste shipments.

Dissecting the data even further, on a country pairs level, reveals that the annual A7 to A7 waste shipments are four to five times greater than the shipments from A7 countries to non-A7 countries. Is this indeed the new and enduring trend?

Cross-checking Trade Route Trend with Basel Secretariat Data

To cross-check this trend in the trade route of toxic waste shipments, the official waste shipments data must be examined. All state parties to the Basel Convention, which now numbers 175, are required to submit data on the waste shipments within their borders to the Basel Secretariat which then collates, compares and publishes the data.

The 2004 to 2006 data are the most recent available information from the Basel Secretariat that have been published and compared. The table below shows the pattern of transboundary waste movement:

Table 6. Pattern of Transboundary Movement

	2004	2005	2006	Change 04/06
Annex VII to Annex VII	7,901,517	8,136,444	10,066,349	27%
Non Annex VII to Annex VII	114,855	177,320	227,845	98%
Non Annex VII to Non Annex VII	1,201,169	736,841	803,323	-33%
Annex VII to Non Annex VII	570,391	283,667	154,866	-73%
Total	9,787,932	9,334,272	11,252,383	15%

Source: Secretariat of the Basel Convention (2010), Waste Without Frontiers

A remarkable figure in the table above is the 73% decreased in the transboundary hazardous waste movement between Annex VII to Non-Annex VII states from 2004 to 2006, which was interpreted and explained by the Basel Secretariat, with regards to the Ban Amendment, in this way:

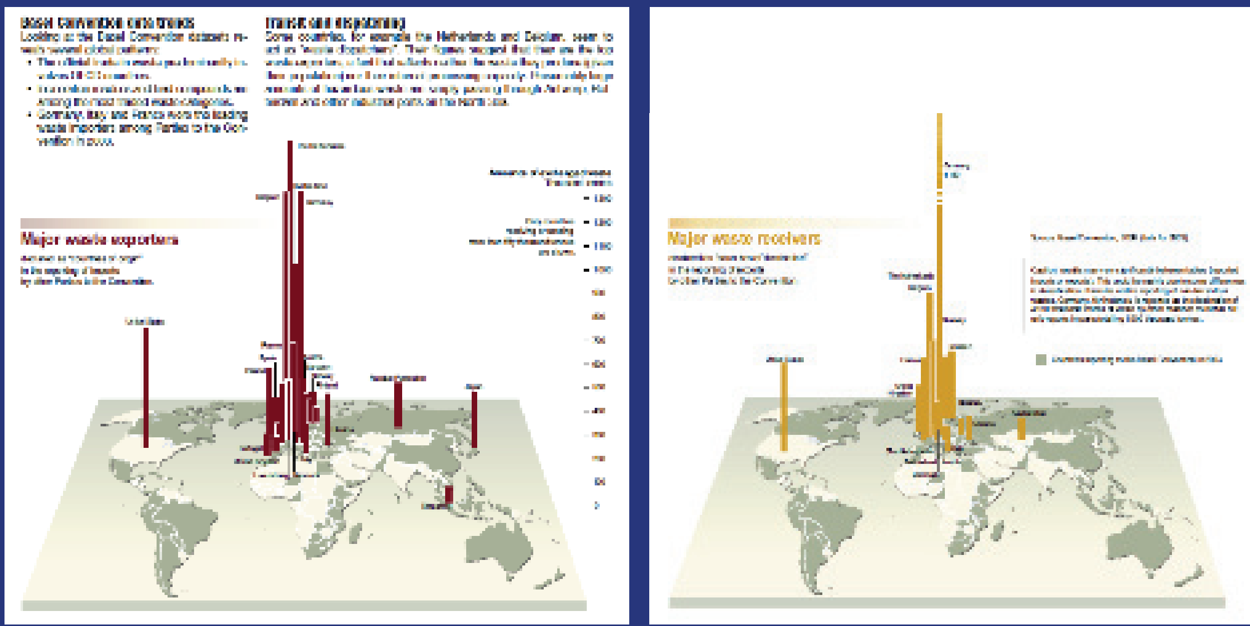
> *"Reported exports of wastes from Annex VII countries to non- Annex VII countries (those that would come under the Ban Amendment if it were to enter into force) are decreasing… [t]he data as reported does suggest that exports that would come under the Ban Amendment are limited in number, amount and seem to be decreasing."*
>
> *"Lead and lead compounds are also moved in relatively large amounts between non-Annex VII countries. Most likely these are lead-acid batteries that are generated in a large number of non-Annex VII countries that do not have recycling facilities for the lead and that are recycled in a limited number of non-Annex VII countries. In particular, the Philippines recycles lead acid batteries from a number of Asian non-Annex VII countries…"* [95]

Another useful way of looking at the trends in the global hazardous wastes transboundary movement is to compare the where the hazardous wastes are coming from and where these are coming into.

[95] Secretariat of the Basel Convention (2010), Waste Without Frontiers.
Available at http://archive.basel.int/pub/ww-frontiers31Jan2010.pdf
Last accessed 31 July 2013

The Basel Secretariat has produced the following to graphically illustrate this point –

Figure 3. Major Waste EXPORTERS vis-à-vis Major Waste IMPORTERS



Source: Secretariat of the Basel Convention (2006), Official Waste Trade Routes. Available at http://www.grida.no/files/publications/vital-waste2/VWG2_p34and35.pdf
Last accessed 31 July 2013

By looking and comparing the two illustrations above it is apparent that European countries have, by and large, confined the transboundary waste movement within their region while the US has also done the same to some extent.

The reason why European countries can now depend on fellow EU/OECD country for hazardous waste disposal is attributed to, among others, Germany becoming one of the top importers of waste, bringing in over 1 million tons of waste from 38 different countries[96] due to the development of newer waste disposal and other clean technology mechanisms.

This demonstrates how closing off the developing countries from waste dumping activities of developed countries may, in fact, economically benefit the one or more developed country which has the strategic location to conveniently accept, and thereupon processed through clean technology, wastes from the neighboring developed countries, as Germany has done. The international economics and trade literature is replete with evidence that other than cost,

[96]Willen, J., International Trade with Waste: Do Developed Countries Use the Third World as a Garbage- Can or Can it be a Possible Win-Win Situation?
Available at http://www.diva-portal.org/smash/get/diva2:132259/FULLTEXT01
Last accessed 31 July 2013

proximate location is one of the primary considerations of countries in deciding to which countries to trade or ship their stuff to.

If the Basel Amendment takes legal force, thru the ratification of the Philippines and 16 other non-ratifying, but Convention member countries, the number of potential waste havens will globally decline thus increasing the cost of exporting waste for developed countries. Faced with this greater cost of dumping toxic wastes in developing countries, there would be a reduced economic incentive for developed countries to ship their wastes to the developing countries. The motivation in finding dumping grounds would then revert back to geographical location or the nearby fellow developed country that has, or will have by necessity, the technology to treat the toxic wastes.

ULABs TRADE AND UTILIZATION

For the Philippines, the pull for waste materials from other countries seems to come from another need – the need for raw or rather re-used materials – that are in turn is needed in the manufacture of other valuable goods. This is particularly true for lead-acid batteries that are put in automotive vehicles to provide the high current required by automobiles. After these particular materials are disposed of or used up in the vehicles in other countries, it is exported into developing countries such as the Philippines, now called Used Lead-Acid Battery (ULAB), where its lead content is recovered and utilized in the manufacture of new car batteries.

The Philippine Recyclers, Inc. (PRI), a subsidiary of the US-based Ramcar Batteries, Inc., is the biggest processors of ULABs in the Philippines which it then converts into Standard Battery Units (SBUs), and commercially sold as the popular car battery Motolite. PRI is a member of the Philippine Association of Battery Manufacturer's Inc. (PABMA) that claims to produce over 5 million SBUs and provides employment for nearly 15,000 people nationwide.[97]

PABMA is one of the staunchest opponent of banning the entry into the Philippines of ULABs because it says that to be able to make the 5 million car batteries 6,436 metric tons of ULABs are needed every month, and while there is an estimated domestic supply of about 3,300 metric tons of ULABs in the Philippines per month (from the car batteries that have been sold and domestically recovered in the previous years), there will still be an evident shortfall of 3,136 metric tons per month or an annual shortfall of almost 38,000 metric tons of ULABs[98] if the entry imported ULABs are to be banned.

This dependence of the Philippines in secondary or re-used materials such as ULAB is due to the fact that it doesn't have an organic source of lead, a mineral that is hardly present in the

[97]Philippine Association of Battery Manufacturer's Inc. (PABMA) claims to produce over 5 million Standard Battery Units (SBUs) and provides employment for nearly 15,000 people nationwide

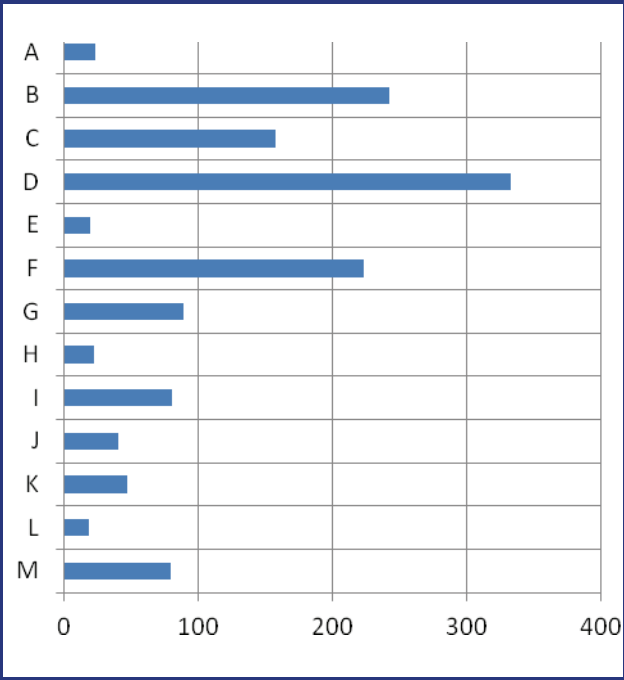
[98]*Ibid.*

country's existing or even potential mine sites, but is something which has no substitute in making lead-acid batteries for cars.

The need for lead-acid batteries increased exponentially due to rapidly increasing demand and sales of automobiles. Between the years 1990-1996, registration of new vehicles in the Philippines increased by almost 80%, when, by contrast, this number remained steady in both the US and Japan, and even declined in Western Europe during the same time period (Hoffman and Wilson 2000). [99] With this surge in demand for vehicle ownership come the higher demand for lead-acid batteries, and the developed countries that were experiencing fewer car demands, and therefore excess ULABs, was just too willing to export their ULABs.

ULAB, even if it is valuable for the manufacture of car batteries, however remains as a hazardous waste since lead in itself is a poisonous substance at certain degrees of contact to humans. This is reflected in the EMB's Survey of Hazardous Wastes in Treatment Recycling Facilities below wherein the most treated/recycled waste category in most facilities is Class D: Wastes with Inorganic Chemicals – consisting of those containing ***lead compounds*** (D406) and ***electronic assemblies and scraps***.

Classification of Hazardous Wastes	Facilities
A: Wastes with cyanide	23
B: Acid wastes	242
C: Alkali wastes	158
D: Wastes with inorganic chemicals	333
E: Reactive chemical wastes	19
F: Inks/Dyes/Pigments/ Paint/Latex/Adhesives/ Organic/Sludge	223
G: Waste organic solvent	89
H: Putrescible/ Organic Wastes	22
I: Oil	80
J: Containers	40
K: Immobilized Wastes	47
L: Organic Chemicals	18



[99] Strohm, L., (2002), Trade and Environment A Teaching Case: The Basel Ban and Batteries (Monterey Institute of International Studies).
Available at http://www.commercialdiplomacy.org/case_study/case_batteries.htm
Last accessed 31 July 2013

These recycled waste materials containing lead compounds pertain, by and large, to ULABs which the Philippines mainly imports for the purpose of recovering and reusing its lead content.

But from where do the Philippines import the ULABs?

The latest available data on lead-acid battery importation of the Philippines shows the following:

Table 7. Lead-Acid Battery Importation
(Import quantity of waste & scrap of primary cells, primary batteries & elec. accumulators; spent primary cells, spent primary batteries)

Year		Import (kg)	Exporting Country
2000		12,356	Malaysia
		336	Thailand
	Total	12,692	
2001		26,273	Thailand
	Total	26,273	
2002		207,000	Bulgaria
		10,500	Thailand
	Total	217,500	
2004		689,360	Bulgaria
		292,518	Malaysia
		19,380	Thailand
		230,016	Singapore
		120,000	Sri Lanka
	Total	1,351,274	
2005		160,740	Papua New Guinea
		87,000	Thailand
		1,600,000	New Zealand
		50,000	Bulgaria
		100,000	Singapore
		12,000	Sri Lanka
	Total	2,009,740	
2006		119,704	Papua New Guinea
	Total	119,704	
2007		3,385,877	Sri Lanka
	Total	3,385,877	
2008		150,000	China
		6,210,905	New Zealand
		111,136	Papua New Guinea
		1,272,770	Singapore
		758,134	Sri Lanka
	Total	8,502,945	
2009		1,700,440	New Zealand
		9	Singapore
		6,512	United States of America
	Total	1,706,961	

2010		106,730	Australia
		35,640	China, Hong Kong SAR
		438,015	New Zealand
		2,220,515	Singapore
		447,050	United Arab Emirates
		401,725	Viet Nam
	Total	3,649,675	
2011		62,858	China
		7,079	Indonesia
		395,630	New Zealand
		4,441,725	Singapore
		8,339,402	United Arab Emirates
	Total	13,246,694	
2012		3,000	China
		43,000	Indonesia
		109,520	New Zealand
		18,332	Republic of Korea
		7,231,111	Singapore
		97,920	United Arab Emirates
		68	United States of America
	Total	7,502,951	

Source: BAN Toxics data compilation (Gutierrez, R.); Ministry of Environment, Japan (2011), Study on Criteria and Requirement on Environmentally Sound Management of Hazardous Wastes and Other Wastes.
Available at http://www.env.go.jp/en/recycle/asian_net/Project_N_Research/PDF/asia%20ESM%20paper.pdf
Last accessed 31 July 2013

At this point it is important to re-state that the Basel Ban Amendment, once it comes into force, will have the effect of prohibiting only those transboundary movements of hazardous wastes between and among non-OECD/EU countries on one hand and OECD/EU countries on the other hand, but NOT hazardous waste trade between and among non-OECD/EU countries. In the language of the Basel Ban Convention, the transboundary movement of hazardous wastes shall be prohibited if it occurs between non-Annex VII and the Annex VII states, which mean that waste trade between equally non-Annex VII states, are still allowed.

Looking at the table, specifically at the list of exporting countries of lead-acid batteries to the Philippines for a period of 13 years, from 2000-2012, it is immediately apparent that a vast majority – 10 out of the 15 countries – from which the Philippines sourced its used lead batteries are non-OECD/non-EU countries. In terms of volume of imports, the five OECD/EU countries which exported used batteries to the Philippines only accounted for roughly 25% of the Philippines' supply needs.

In 2005, among the six countries that the Philippines exported ULABs from, only 2 – New Zealand and Bulgaria – are OECD or Annex VII countries. While the four other countries are non-OECD members and accounted for over 21,000 metric tons or an overwhelming 72% of the total ULABs imported.

While in 2004, the two countries from which the Philippines imported the ULABs – Singapore, Sri Lanka and Thailand – from are all non-OECD/non-EU or non-Annex VII countries from which more than 36,000 metric tons of lead batteries were sourced. The only logical conclusion form this is that the entry of ULABs into the Philippines will hardly be affected by the Basel Ban as the ULABs are in fact imported from countries that will not be covered by the Basel Ban.

Surprising as this may seem, a marked departure from the early hazardous waste business model of trans-boundary movement from developed to developing countries, such trend in the Philippines is consistent with the recent data of global waste trade by the Secretariat of the Basel Convention and with the empirical analysis done by Levinson and Kellenberg using the UN Comtrade proxy table and observations.

E-WASTES IMPORTS

When the DENR adopted DAO No. 28, series of 1994 allowing for importation of electronic assemblies and scraps, it did not only give life to surplus shops selling second-hand appliances, but it paved the way for the entry into the country of another source or class of hazardous wastes – the electronic wastes or e-wastes.

E-waste, or also referred to as Waste Electrical and Electronic Equipment (WEEE), is term that is used loosely to refer to obsolete, broken, or irreparable electronic devices like televisions, computer central processing units (CPUs), computer monitors (flat screen and cathode ray tubes), laptops, printers, scanners, and associated wiring.[100] Simply put, the electronic assemblies and scraps that the Philippine imports from other countries becomes or are e-wastes in themselves as soon as there are broken or damaged and the hazardous component in it exposed. Aside from direct human exposure to the hazardous or toxic components in e-waste, another concern is the improper disposal of e-wastes in open dumpsites which may lead to toxic elements leaching into the atmosphere, soil, and groundwater.

Nevertheless, the reason for e-wastes importation into the Philippines is because after its treatment, consisting mainly of disassembly and related processes, it can yield many valuable metals and other components that may be recovered for reuse as raw materials. Thus, the

[100]Luther, L., (2010), Managing Electronic Waste: Issues with Exporting E-Waste.
Available at http://www.fas.org/sgp/crs/misc/R40850.pdf
Last accessed 31 July 2013

segregation, collection, and diversion of these wastes into recycling facilities are also economic activities. Table 4 below shows the metal composition of various electronic wastes.

Table 8. Metal Composition of Various Electronic Wastes (adapted from Cui and Zhang, 2008).

Electronic Waste Type	Weight (in percentage)			Mass (in parts per million)				
	Iron (Fe)	Copper (Cu)	Aluminum (Al)	Lead (Pb)	Nickel (Ni)	Silver (Ag)	Gold (Au)	Palladium (Pd)
TV board scrap	2	10	10	1.0	0.3	280	20	10
PC board scrap	7	20	5	1.5	1	1000	250	110
Mobile phone scrap	5	13	1	0.3	0.1	1380	350	210
Portable audio scrap	23	21	1	0.14	0.03	150	10	4
DVD player scrap	62	5	2	0.3	0.05	115	15	4
Calculator scrap	4	3	5	0.1	0.5	260	50	5
PC mainboard scrap	4.5	14.3	2.8	2.2	1.1	639	566	124
Printed circuit boards scrap	12	10	7	1.2	0.85	280	110	–
TV scrap (CRTs removed)	–	3.4	1.2	0.2	0.038	20	<10	<10
Electronic scrap	8.3	8.5	0.71	3.15	2.0	29	12	–
PC scrap	20	7	14	6	0.85	189	16	3
Typical electronic scrap	8	20	2	2	2	2000	1000	50
Printed circuit boards	5.3	26.8	1.9	–	0.47	3300	80–	

That electronic products consumption and wastage have burgeoned is not surprising considering that in the last two decades, the global growth in electrical and electronic equipment production and consumption has been astronomical. This is largely due to increasing market penetration of products in developing countries, development of a replacement market in developed countries and a generally high product obsolescence rate (United Nations Environment Programme, DTIE, 2007a), together with a decrease in prices and the growth in internet use. Today, electrical and electronic waste (hereafter referred to as e-waste) is the fastest growing stream (about 4 per cent growth a year) of waste.[101]

About 40 million tonnes of e-waste is created each year (Schluep, M. et al. 2009), though getting precise estimations of e-wastes is difficult because the flows of secondary and waste products

[101]International Labour Office, The Global Impact of E-waste: Addressing the Challenge Available at http://www.ilo.org/sector/Resources/publications/WCMS_196105/lang--en/index.htm Last Accessed 31 July 2013

[102]*Ibid.*

[103]*Ibid.*

In general however, large household appliances are known to represent the largest proportion (about 50 per cent) of e-waste, followed by information and communications technology equipment (about 30 per cent) and consumer electronics (about 10 per cent).[104]

In the Philippines there are no official statistics as to the number of e-waste generated. But in a presentation made by the Chief of the Hazardous Waste Management Section of the EMB, the following information on the Top 10 Countries of Origin of e-waste in the Philippines[105] was presented:

Table 9. Top Exporters and E-Waste Export Volumes to the Philippines from 2001-2005

Rank	2001		2002		2003		2004		2005	
	Country	Wt (kg)	Country	Wt (kg)	Country	Wt (kg)	Country	Wt (kg)	Country	Wt (kg)
1	Japan	4,332,780	Japan	13,178,302	China	6,867,732	China	7,951,645	China	9,581,248
2	South Korea	3,611,893	South Korea	4,409,806	Japan	5,334,834	South Korea	7,474,198	South Korea	5,399,974
3	China	1,642,552	Hong Kong	2,383,901	South Korea	4,867,770	Japan	4,872,806	Japan	4,968,719
4	Hong Kong	1,167,605	China	2,374,698	Hong Kong	4,278,358	Hong Kong	3,950,155	Singapore	2,958,081
5	Thailand	309,543	Thailand	1,208,322	Indonesia	1,384,506	Singapore	1,839,378	Hong Kong	1,779,025
6	Australia	159, 556	Singapore	410,633	Singapore	612,558	Thailand	677,558	Taiwan	1,132,334
7	USA	148,086	Indonesia	399,782	Thailand	579,828	India	432,165	Thailand	510,785
8	Taiwan	109,425	Taiwan	377,481	Taiwan	504,390	Taiwan	389,249	India	255,708
9	Malaysia	49,374	USA	244,998	Australia	134,986	Australia	53,362	USA	192,926
10	Indonesia	45,546	Australia	176,778	USA	75,484	USA	47,596	Australia	49,174
	Others	131,709	Others	153,893	Others	95,565	Others	47,814	Others	80,572
	Total	11,703,069	Total	25,318,594	Total	24,736,011	Total	27,735,926	Total	26,908,546

The table above shows that from 2001-2005 Japan and China were the top source of e-wastes imported into the Philippines. It bears stressing that China is neither an OECD nor an EU country, while although Japan is an OECD member the JPEPA has already been entered into between the Philippines and Japan which may be interpreted to mean that the Ban Amendment will have no effect on the on-going waste trade.

Moreover, looking at the foregoing e-waste importation volume of the Philippines it would appear that the demand for e-wastes in the Philippines ranges from 11,000 to 28, 000 kilograms.

[104] *Ibid.*

[105] Sanez, Geri G. 2010. E-Waste Management in the Philippines. Regional workshop on E-waste management. Osaka, Japan. 6-9 July 2010

Table 10. Import Clearance Issued for E-Waste Importation

Year	Materials	Description	Quantity Volume	Unit	Source
2005	Plastic/Electronic Scrap	Recyclable VHS Tapes	21.3	MT	Korea
	Scrap Electronics	Used Computer Units with Accessories	240	Sets	Korea
	Scrap Electronics	Used Refrigerators	20	Pcs.	Japan
	Scrap Electronics	Used TV	66	Units	Japan
	Scrap Electronics	Used TV Sets	472	Pcs.	Japan
2006	Electronic Scraps	Assorted Electronic Components	2,000	MT	Thailand
2007	Scrap Electronics	Used Computers	8,000	Units	South Korea

Year	Materials	Description	Quantity Volume	Units	Source
2008	Electrical and electronic assemblies or scraps	Assorted electrical and electronic components	200	MT	Thailand
	Electronic Scraps	Used computer sets	8,000	sets	Korea
	Used Electrical and Electronic Equipment	Used CPUs	3,000	sets	Korea
	Used Electrical and Electronic Equipment	Used laptops	2,000	sets	Korea
	Used Electrical and Electronic Equipment	Used monitors `	2,500	sets	Korea
	Used Electronics and Electrical Appliances and Equipment	Used game machine	112	pcs	Japan
	Used Electronics and Electrical Appliances and Equipment	Used LCD monitor	88	pcs	Japan
	Used Electronics and Electrical Appliances and Equipment	Used PC	23	pcs	Japan
	Used Electronics and Electrical Appliances and Equipment	Used PC parts	1	pc	Japan
	Used Electronics and Electrical Appliances and Equipment	Used Television	784	pcs	Japan
	Used Electronics and Electrical Appliances and Equipment	Used Television sets	409	pcs	Korea
	Used Electronics and Electrical Appliances and Equipment and Appliances	Used Television sets and computers	3,000	pcs	Japan

E-WASTES DOMESTIC GENERATION

Aside from imported electronic assemblies and scraps cum as e-wastes, various electrical and electronic items are also sold, utilized and thereafter disposed of in the Philippines. In fact, HRM Envirocycle thrives and profits from the treatment of these domestically generated e-wastes alone, as shared by its Manager in an interview with the authors.

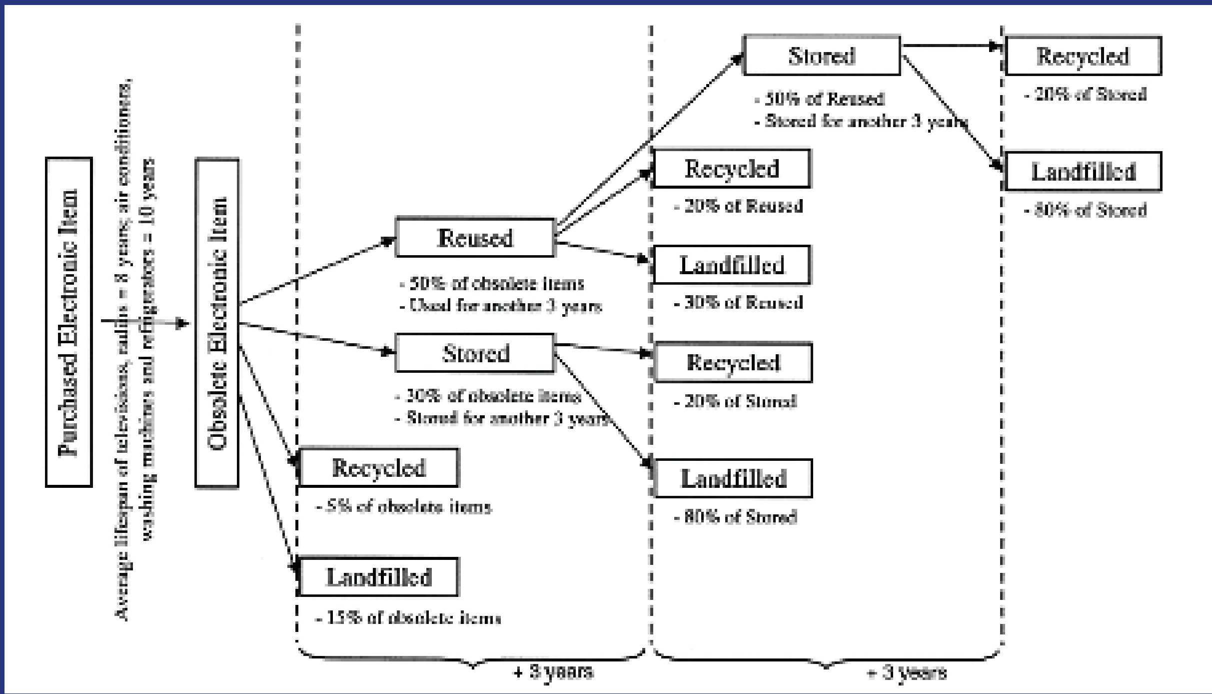
There is however no data regarding the volume of domestically generated e-wastes in the Philippines. To address this, a pioneering work by Peralta and Fontanos (2006) tried to estimate domestic e-waste generation by basically comparing the volume of certain domestically sold electronic items or appliances (i.e., air conditioners, washing machines, refrigerators, radios) and its end-of-life cycle (i.e. reused, stored, recycled, landfilled) volume. The study was updated in 2008 to include Personal Computers (PCs).

Fontanos, et al. did the estimates by first obtaining the electronic sales data taken from the National Statistics Office (NSO). These numbers are used for calculating the amount of obsolete equipment generated. A simple model is then utilized to illustrate the end-of-life options of electronic products. This is patterned after the diagram used in a Carnegie Mellon University study[106] conducted to predict the number of computers that would be reused, stored, recycled, or landfilled in the United States by 2005.

The same model is applied by the authors of this study covering the six electronic items earlier considered in the studies of Fontanos, et al., with same expansion of the concept illustrated below:

[106]Matthews, H., McMichael, F., Hendrickson, C., Hart. D., (2007), Disposition and End-Of-Life Options for Personal Computers – Carnegie Mellon University Green Design Initiative Technical Report #97-10
Available at http://www.ce.cmu.edu/greendesign/comprec/newreport.pdf
Last accessed 31 July 2013

Figure 4. Expanded end-of-life model with predictive assumptions.



Source: Peralta, G. and Fontanos, P. 2006. E-waste Issues and Measures in the Philippines. J. Matter Cycles Water Management. 8:34-39.

The parameters[107] utilized are the following:

Parameters	Value
Lifespan of electronic device	
Television	8 years
Air Conditioner	10 years
Washing Machine	10 years
Refrigerator	10 years
Radio	8 years
PC	3 years
% of Obsolete reused	50% (45% for PC)
% of Obsolete recycled	5% (05% for PC)
% of Obsolete stored	30% (45% for PC)
% of Obsolete landfilled	15% (05% for PC)
Lifespan of reused electronic item	3 years (2yrs for PC)
% of Reused recycled	20% (40% for PC)
% of Reused stored	50% (50% for PC)
% of Reused landfilled	30% (10% for PC)
Lifespan of stored electronic item	3 years
% of Stored recycled 20%	(75% for PC)
% of Stored landfiled 80%	(25% for PC)

[107]Peralta, G. and Fontanos, P. 2006. E-waste Issues and Measures in the Philippines. J. Matter Cycles Water Management. 8:34-39.

First Step: Get the available sales data of television, air conditioner, washing machine, refrigerator, radio and PC from the NSO. The sales data is summarized below:

Year	Television	Air Conditioners	Washing Machines	Refrigerators	Radios	PCs
1995	926,629.00	170,529.00	508,103.00	557,017.00	576,002.00	----
1996	972,961.00	179,055.00	533,508.00	584,868.00	604,801.00	----
1997	911,339.00	225,362.00	676,554.00	603,632.00	617,170.00	----
1998	765,240.00	308,500.00	524,200.00	488,000.00	799,400.00	----
1999	799,300.00	250,500.00	525,500.00	459,426.00	595,600.00	----
2000	930,300.00	320,500.00	576,700.00	445,300.00	715,300.00	59,255.00
2001	883,100.00	371,900.00	570,600.00	484,200.00	601,400.00	145,797.00
2002	943,000.00	393,700.00	588,800.00	464,500.00	495,300.00	142,025.00
2003	1,014,500.00	501,100.00	685,000.00	612,500.00	402,200.00	226,334.00
2004	1,049,876.20	550,330.68	718,395.48	635,180.05	408,638.05	184,731.00
2005	1,086,485.99	604,398.05	753,419.08	658,699.91	415,179.15	179,131.00
2006	1,124,372.38	663,777.27	790,150.16	683,090.67	421,824.96	206,569.00
2007	1,163,579.90	728,990.22	828,671.98	708,384.60	428,577.14	216,897.00
2008	1,204,154.60	800,610.04	869,071.83	734,615.12	435,437.41	227,742.00
2009	1,246,144.16	879,266.15	911,441.28	761,816.93	442,407.50	239,129.00
2010	1,289,597.93	965,649.86	955,876.34	790,025.98	449,489.15	251,085.00

Second Step: Apply the Estimation Equations[108]

$R_u = 0.5O_j$ (1)
$S_t = 0.3O_j + 0.25O_{j-3}$ (2)
$R_c = 0.05O_j + 0.16O_{j-3} + 0.05O_{j-6}$ (3)
$L_a = 0.15O_j + 0.39O_{j-3} + 0.20O_{j-6}$ (4)

R_c = number of recycled items for the year
=5% of obsolete items for the current year + 20% of stored items from 3 years earlier + 20% of reused items from 3 years earlier + 20% of stored items from 6 years earlier
$=0.05O_j + 0.20(0.30)(O_{j-3}) + 0.20(0.50)\ (O_{j-3}) + 0.20(0.50)(0.50O_{j-6})$

$R_c = 0.05O_j + 0.16O_{j-3} + 0.05O_{j-6}$ (5)

L_a = number of landfilled items for the year
= 15% of obsolete items for the current year + 80% of stored items from 3 years earlier + 30% of stored items from 6years earlier
$= 0.15O_j + 0.80(0.30)(O_{j-3}) + 0.30(0.50)(O_{j-3}) + 0.80(0.50)(0.50\ O_{j-6})$

$L_a = 0.15O_j + 0.39O_{j-3} + 0.20O_{j-6}$ (6)

Where *O* is the number of obsolete items for the year, j is the year, and the subscript j − 3 and j − 6 means 3 or 6 years before the current year. Ru is the number of reused items for the year, St is the number of stored items for the year, Rc is the number of recycled items for the year, and La is the number of landfilled items for the year.

Equation 1 is used to calculate the number of reusedobsolete items. Equation 2 determines the number of stored items for a given year. It should be noted that this is dependent on the current number of obsolete items as well as the obsolete items 3 years before the current year. This came about as a result of the assumption that when items are stored, they remain idle for 3 years and as such do not enter the waste stream immediately after becoming obsolete. Equations 3 and 4 determine the number of available items for recycling and landfilling, respectively.

[108] *Ibid.*

Third Step: Summary of Computation Results by 5-year Cycles

i. Television

Year	Television (units)				
	Obsolete	Reused	Stored	Recycled	Landfilled
1995	627,179.00	313,589.50	188,153.70	31,358.95	94,076.85
2000	800,457.00	400,228.50	413,003.35	180,522.95	509,202.70
2005	911,339.00	455,669.50	494,027.70	224,884.59	633,345.41
2010	1,289,597.93	943,000.00	471,500.00	482,725.00	223,686.05
2015	1,530,680.41	1,163,579.90	581,789.95	611,543.02	270,314.19
2020	1,816,831.79	1,381,104.07	690,552.04	725,867.26	324,656.89

By 2015, it is estimated that 1.5 Million units of television sets will become obsolete, and another 1.8 Million obsolete units by 2020, with 1.3 Million units being reused.

ii. Air Conditioner

Year	Air Conditioners (units)				
	Obsolete	Reused	Stored	Recycled	Landfilled
1995	104,690.00	52,345.00	31,407.00	5,234.50	15,703.50
2000	133,614.00	66,807.00	68,939.45	25,148.06	65,056.29
2005	170,529.00	85,264.50	87,985.95	38,458.44	108,480.06
2010	320,500.00	160,250.00	152,490.50	60,203.37	168,447.98
2015	604,398.05	302,199.02	279,744.41	105,736.90	294,302.71
2020	965,649.86	482,824.93	471,942.51	192,437.46	539,219.80

By 2015, it is estimated that over 600,000 units of air conditioners will become obsolete, and another 965,000 units obsolete units by 2020, with over 470,000 units being stored.

iii. Washing Machine

Year	Washing Machines (units)				
	Obsolete	Reused	Stored	Recycled	Landfilled
1995	311,931.00	155,965.50	93,579.30	15,596.55	46,789.65
2000	398,112.00	199,056.00	205,409.60	74,930.24	193,839.36
2005	508,103.00	254,051.50	262,160.40	114,589.73	323,224.27
2010	576,700.00	288,350.00	342,148.50	161,278.99	447,142.46
2015	753,419.08	376,709.54	373,225.72	158,153.95	447,744.86
2020	955,876.34	477,938.17	493,930.90	216,301.11	610,242.62

By 2015, it is estimated that over 753,000 units of washing machines will become obsolete, and another 955,000 units obsolete units by 2020, with 216,000 units being recycled.

iv. Refrigerator

Year	Refrigerators (units)				
	Obsolete	Reused	Stored	Recycled	Landfilled
1995	341,960.00	170,980.00	102,588.00	17,098.00	51,294.00
2000	436,437.00	218,218.50	225,183.85	82,143.61	212,499.84
2005	557,017.00	278,508.50	287,398.10	125,621.12	354,340.63
2010	445,300.00	222,650.00	284,498.00	145,370.72	408,309.88
2015	658,699.91	329,349.95	313,734.97	130,226.30	371,845.19
2020	790,025.98	395,012.99	414,103.94	184,601.84	521,809.90

By 2015, it is estimated that 658,000 units of refrigerators will become obsolete, and another 790,000 obsolete units by 2020, with 521,000 units being landfilled.

v. Radio

Year	Radios (units)				
	Obsolete	Reused	Stored	Recycled	Landfilled
1995	389,861.00	194,930.50	116,958.30	19,493.05	58,479.15
2000	497,572.00	248,786.00	256,726.85	112,214.76	316,525.19
2005	617,170.00	308,585.00	322,294.25	142,324.08	401,294.57
2010	495,300.00	247,650.00	297,490.00	150,301.05	427,539.20
2015	428,577.14	214,288.57	230,732.66	116,880.94	343,935.41
2020	463,994.34	231,997.17	249,800.18	115,076.16	326,503.07

By 2015, it is estimated that over 428,000 units of radios will become obsolete, and another 463,000 units obsolete units by 2020, with 249,000 units being stored.

vi. PC

Year	PCs (units)				
	Obsolete	Reused	Stored	Recycled	Landfilled
2005	142,025.00	63,911.25	63,911.25	7,693.80	7,101.25
2010	216,897.00	97,603.65	139,168.13	52,225.30	49,851.71
2015	292,070.14	131,431.56	185,235.59	89,126.98	67,326.64
2020	426,238.93	191,807.52	268,250.22	119,606.30	93,383.71

Just looking at the volume of obsolete televisions, air conditioners, radios, washing machines, refrigerators and PCs by 2015, there would be over 4 Million units of these appliances or electronics that would become obsolete two years from now. This is far more than the volume of e-wastes that the Philippines has been importing.

From the foregoing, it is easy to conclude that the amount of e-waste domestically generated in the Philippines overwhelmingly exceeds the amount of e-waste being exported. Thus, even if the absent of e-waste imports the industries and sectors in the Philippines relying on e-waste as raw materials or extracting its economic value would not greatly suffer.

FORMAL V. INFORMAL RECYCLING

Formal and informal businesses that treat these e-wastes have sprouted in order to profit from the materials recovery from it. One of these formal businesses is HMR Envirocycle which occupies a 5,000 square meters facility in Santa Rosa, Laguna and processes about 200 tons of e-waste per month. The complete list of registered e-waste treaters are as follows:

Wow Recycling Manufacturing, Inc.
BCEZ-STP Compound, Baguio City Economic Zone, Loakan Road, Baguio City Benguet, CAR

Tritronics Technology Philippines, Inc.
Lot 1 Block 9, 5th Street, Golden Mile Business Park, Brgy. Maduya, Carmona Cavite, R4A

Maritrans Recycler, Inc.
Sitio BAas, Barangay Pagsabungan Mandaue City Cebu,

Integrated Recycling Industries Phils., Inc. (IRIPI)
Lot C4-5B CIP II, SEPZ, Brgy. Punta, Calamba Laguna, R4A

Green Korea, Inc
Lot 2 Blk. 1 Metrococo Bldg., A & B Filinvest Technology Park, Calamba Laguna, R4A

Asia Metal Trading Corporation
Lot 28, New Cavite Industrial City, Stateland, Manggahan Gen. Trias Cavite, R4A

RRDS Petro-Chemical Industries, Inc.
Brgy. Pakna-an, Mandaue City Cebu,

Sardido Industries, Inc.
Remulla Drive, Brgy. Sahud-Ulan Tanza Cavite, R4A

Southcoast Metal Enterprise, Inc.
Block 7B, CEZIA Road, Phase II, Cavite Economic Zone, Rosario Cavite, R4A

HMR Envirocycle Philippines, Inc. (HEPI)
Silangan Industrial Park, Canlubang Calamba Laguna, R4A

258 Global Venture, Inc.
Sitio Muzon, Brgy. Puting Kahoy, Silang Cavite, R4A

TMC Metal Philippines
Lot. No. C2-1 Carmelray Industrial Park II, Brgy. Punta Calamba Laguna, R4A

ELMS Industrial (Phils.) Co., Inc.
Blk. 1 Lot 6, Calamba Premiere International Park (CPIP), Calamba Laguna, R4A

Solvtech Consultancy Resources
Blk. 11 Lot 6A, Phase I, Sterling Technopark, Maguyam, Silang Cavite, R4A

On the other side of the coin is the informal material recovery or treatment e-waste. While the DENR requires treaters and transporters of materials containing hazardous wastes to be accredited, backyard recycling and other forms of informal recycling exist. This has also been acknowl-

A special report that appeared in an online news portal is descriptive of this sector, viz:

E-Waste: E-Gold, E-Poison
By Lira Dalangin-Fernandez
Interaksyon.Com Special Report

A poor community in Caloocan City in northern Metro Manila is practically an e-waste village, many of its residents making a living by picking through electronic garbage.

Early in the morning, young people board pedicabs -- bicycles with sidecars -- and set out for neighboring villages and cities to gather electronic junk. Shortly after noon, they return to their village with their loot, dismantle this and sell everything of value to junkshops owners. The muddy road leading to the village -- shards of glass from smashed TV sets sticking out of the earth, charred computer parts lining side streets, a tangle of wires tripping up young feet running on dirt paths -- leaves no doubt about what this place is, a literal electronic graveyard.

"You should see the river nearby," said one of the waste pickers. "You can't step in the water without stepping on a shard of a broken TV glass." Diego Pepito, 34, has been the go-to guy for waste pickers who want to get rid of the CRT TV screen after taking the valuable parts. He is paid P50 for dismantling a TV unit and crushing the screen. Pepito said he has been crushing television sets for the more than three years since he fell from a roof during construction work and broke his leg.

In one day, he said he crushes at least seven TV sets for a princely P350. He also sells the steel lining of the screens for 10 pesos a kilo. After crushing a screen, Pepito gathers the broken glass in sacks he stacks beside his shanty. Over three years, the stack is about two feet high and 10 feet long. "I plan to use that to build the torn wall of our house," said the father of three. "I am just saving money to buy cement. The glass could be a good foundation."

Asked if he is not worried about getting sick from exposure to the toxic substances in the discarded TV sets, he said, "Ang pinakamalala na nangyari sa akin eh masugatan sa bubog (The worst thing that has happened to me is cutting myself on the shards)."Tsaka iyong sinasabi nilang usok na lumalabas pag binasag iyong dulo ng picture tube, wala talaga iyon, usok lang iyon (And the smoke they say is emitted when you smash the end of the picture tube, it's nothing, it's just smoke)," he added.

Available at http://www.interaksyon.com/ewaste-egold-epoison
Last accessed 31 July 2013

Informal recycling has also been acknowledged in other scholarly literature. For instance, Fujimori, et al., determined that electronic waste is often dismantled and recycled by unregulated companies and untrained individuals (Fujimori et al, 2012). Other literature attributes environmental problems arising from recycling materials containing hazardous substances to primitive techniques (i.e. open burning) or the absence of appropriate control systems (i.e. emission control, wastewater treatment) (Terazono, et al, 2006, Sakai, 2004, Schleup, 2009)

This is not to say that formal, regulated recycling companies do not cause any environmental problems. Even the International Labor Organization recognizes that heavy metal contamination has been found even in state of the art facilities in developed countries (Lundgren, 2012). However, at the very least, DENR accredited TSDs are expected to comply with guidelines for environmental quality as presented by the Clean Air Act, the Solid Waste Management Act, and the Clean Water Act. These companies are also expected to submit an Environmental Impact Assessment report before they are granted an Environmental Compliance Certificate. Such companies are required to employ a Pollution Control Officer – whose task is to monitor environmental conditions and the submit reports to the EMB. In addition, some companies recognize the need to go beyond compliance and have themselves accredited by the International Order for Standardization (ISO).

As a case in point, Integrated Recycling Industries Philippines Inc. (IRI), located in the Carmelray Industrial Park II in Calamba, Laguna, is an EMB accredited transported and TSD. According to their general manager, IRI does not directly import recyclable wastes containing hazardous substances. However, local companies which are in the business of importing electronic assemblies for repair or refurbishment (i.e. mobile phones) send the un-repairable equipment to IRI for disassembly and recycling. IRI accepts wastes containing non-ferrous metals (i.e. copper, nickel, tin, aluminum, etc.), precious metals (i.e. gold, silver, palladium), and various plastics, mostly from semiconductor industries (Figure 4).

(a) (b)

Figure 5. Examples of recyclable materials accepted by IRI. (a) waste integrated circuit holders; (b) assorted waste plastics (photo credit: Doris B. Montecastro)

Aside from being accredited by various local agencies, IRI has also been accredited with ISO 9001:2000 (quality management system) and ISO 14001:2004 (environmental management system). In addition, they are also certified with OHSAS 18001:2007 (occupational health and safety). IRI conducts regular monitoring of indoor air quality (particulate matter, nitrogen oxides, sulfur oxides, lead, carbon monoxide), ambient air quality (total suspended particulates, lead, nitrogen dioxide, sulfur dioxide), and noise levels. In addition, the company also monitors their employee's blood lead (PbB) and hearing levels (audiometry). Ocular inspection of the premises also shows that the employees are provided with personal protective equipment to minimize their exposure to hazardous substances.

In contrast, informal recycling often consists of manual disassembly and uncontrolled burning. An inspection of the Payatas dumpsite showed scavengers, some of whom were children, burning wires and cables to remove the plastic casing (Yoshida and Terazono, 2010). This exposes them to persistent organic pollutants such as dioxins and furans, and brominated flame retardants. Informal recycling operations also exist as backyard operations, often located near residences (Sulpido and Ong, 2000). This exposes children, mothers, and other individuals who do not directly participate in the recycling activities but because of proximity, they are also subjected to hazardous substances. In addition, employees of informal recycling operations commonly do not use personal protective equipment such as gloves or masks (Fujimori, et al., 2012).

Aside from the issues related to recycling activities, a more fundamental problem is the determination of material functionality and the appropriate labels for reusable (i.e. second hand, may be repaired ore refurbished) and recyclable materials. According to the Hazardous Waste Division Chief of the Environmental Management Bureau, one of the primary issues regarding the transboundary movement of materials containing hazardous waste is: whose responsibility is it to test whether the materials being imported is recyclable or reusable? For instance, in a study conducted by Yoshida and Terazono, it was determined that about one third of all imported second hand TVs from Japan cannot be reused, repaired or refurbished (Yoshida and Terazono, 2010).

RECYCLING PROCESS OF E-WASTES

Because of their varied compositions, electronic waste recycling is a complex process involving collection, separation/dismantling, pre-processing (cleaning), end processing (Figure 3). Each stage of the recycling process will have its own corresponding environmental and human health impacts.

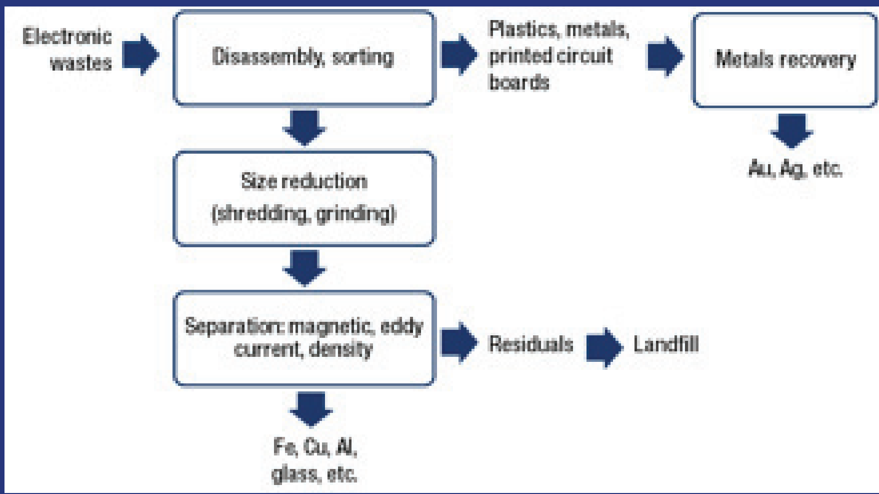


Figure 6. Summary of electronic waste recycling and metals recovery.

Cathode Ray Tubes (CRTs) are the video display component of televisions and computers prior to flat screen era. It is estimated that CRT glass makes up 47% of the mass of commercial electronics, and 30% of the mass of data processing equipment (Herat, 2008). CRTs also contain metals such as lead – which may leach into the environment if not properly handled after disposal. Turbini, et al., in 2001 found that 40.2% of lead in municipal solid waste originated from consumer electronics – majority of which were televisions. Table 5 below lists the lead content of the different CRT components.

Table 11. CRT lead content in percent mass (Nnorom and Osibanjo, 2008)

	Color CRT	Monochrome CRT
Panel	0 – 3	0 – 3
Funnel	24	4
Neck	30	30
Frit	70	N/A

In order to recycle CRTs, it must be disassembled first to separate the different components that require different treatments. The first step in CRT disassembly is the separation of the panel and funnel glass. This is done through an electric wire heating method or through a gravitational fall method.

In electric wire heating, a wire is wrapped around the connection between the panel and the funnel glass. An electric current is then allowed to run through the wire to heat the glass, after which a cold current of air is directed towards the heated area to induce separation through thermal shock. This whole process may be accomplished in 1 – 3 minutes (Lee et al, 2004).

In the gravimetric fall method, the CRT is dropped from a height breaking the funnel glass on impact. The panel glass can then be separated from the broken funnel glass.

The second step is to remove the glass coatings, which may contain heavy metals. This can be done in a variety of ways, including vacuum suctioning (vacuum pressure is used to remove the coating from the glass); ultrasonic cleaning (glass is immersed in an acid bath and sonicated to remove the coating); sandblasting (small sand or steel particles are blasted onto the surface of the glass to remove the coating); and wet scrubbing (broken glass pieces are tumbled in water where physical shear removes coating).

The cleaned CRT glass are then recycled either through glass-to-glass (closed loop) methods or through glass-to-lead (open loop) methods.

In glass-to-glass recycling, the different glass components of the CRTs are recovered to make new glass. This involves many mechanical steps that result in the production of dust, which if not contained, may pose a hazard to human health and the environment.

In glass-to-lead recycling, lead and copper is separated from CRT glass through smelting. Unlike glass-to-glass recycling, this process is automated and thus minimizes dust production (Herat, 2008).

Printed circuit boards (PrCB) are ubiquitous in all commercially produced electrical and electronic devices. As with other electronics, the fast pace of technological innovation and aggressive marketing strategies result in accelerated replacement rates (Huang, et al., 2007). This leads to the increase in waste generation rates for PrCBs.

PrCBs contain many economically valuable metals, the purity of which is ten times higher than that of commercially mined minerals (Betts, 2008). Hence, they are considered as an "urban mineral resource" (Huang, 2009). Aside from metals, PrCBs also contain poxy resins and fiberglass, which may be treated with brominated fire retardants (BFR). Table 6 below shows the material composition of end of life PrCBs.

Table 12. Materials found in PrCBs (Goosey and Kellner, 2002)

Material	Percent composition
Non-metallic (ex. poxy resins, fiberglass)	70
Copper	16
Solder	4
Iron, ferrite (from transformer cores)	3
Nickel	2
Silver	0.05
Gold	0.03
Palladium	0.01
Other (bismuth, antimony, tantalum etc)	<0.01

Common methods for metal recovery from PrCBs include copper-smelting, physical separation, and scraping. In copper-smelting, the fiberglass is melted into slag, and the epoxy resin is incinerated to liberate the metals. While this method results in virtually no solid waste and the copper can be totally recovered, incineration of the epoxy resin and fiberglass containing brominated fire retardants, may result in the formation of dioxins. If this is not controlled, then the dioxins can enter the atmosphere and pose a risk to human and environmental health. Physical separation involves a crushing the waste PrCBs and then separating the crushed components through its various physical properties such as size and electrical-conductivity. These processes separate the non-recyclable components from the metals. This is a water- and chemical additive-free process but may result in dust emissions and noise pollution (Lee, 2004).

In the scraping process, heat is used to melt the solder, making it easy to scrape off the mounted electronic parts. This separates the clean fiberglass board from the rest of the metals, for separate processing.

RECYCLING PROCESS OF ULABS

Lead-acid battery production has been estimated to account for 80% of global lead consumption (Ellis and Mirza, 2010). Commonly, lead-acid batteries contain approximately 7.94kg of lead and 5.68 liters of sulfuric acid (Zhang, 2008) and used/spent batteries are composed of 24-30% (by weight) lead and lead alloy grid and 30 – 40% (by weight) lead paste (Zhu et al., 2012). This makes ULAB recycling a significant source of secondary lead.

Assuming proper segregation, collection, and transportation, ULABS arrive at recycling plants intact. In large-scale, regulated facilities, human contact is minimized and operations are largely machine operated.

As the ULABs arrive at the recycling facility, they are first drained to separate the sulfuric acid from the other solid battery parts. The batteries are then broken apart for efficient processing of its remaining components: lead plates, plastic casings, lead paste, and metal connectors. The plastic component is sent to a plastic recycler. Other non-recoverable materials such as ebonite are disposed of. For large-scale, regulated facilities, battery breaking is done mechanically, and human contact is minimized as much as possible.

Lead may be found not only in the lead plates and lead paste, but also in the sulfuric acid solution. These three components are sent to the furnace for recovery. Lead is commonly recovered through pyrometallurgical techniques (Lin, et al., 2006) where heat and reducing agents transform waste lead into its basic metallic form. While lead recovery in such methods is high, this is also an energy and material intensive process and requires several preparatory steps such as lead paste desulfurization to recover lead oxide, and acid neutralization to precipitate lead hydroxide. These, combined with the metallic components, enter the furnace where high heat, flux and reducing substances convert lead into its reduced form. At this point, lead is still in crude form and a final refining process is needed, where high temperatures and the stepwise addition of reagents results in refined lead.

Hydrometallurgy is an alternative method to recover lead. This technique employs electrolysis to regenerate pure lead after hydrochloric acid and sodium chloride leaching. Reductive electrolysis then converts this to metallic lead. Figure 2 below summarizes the ULAB recycling process.

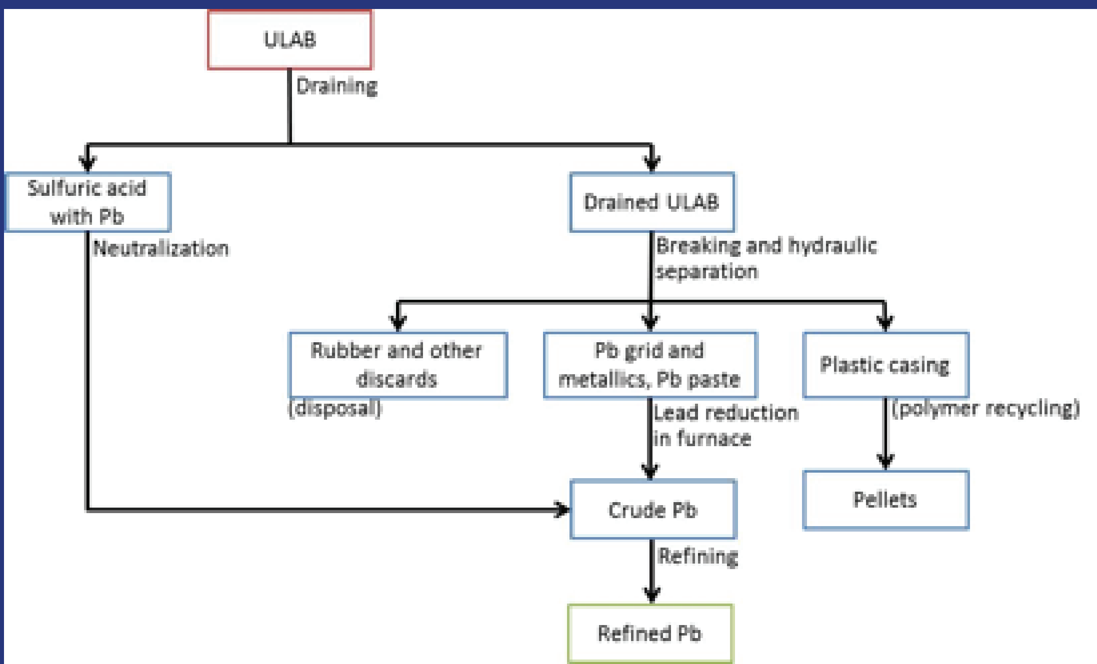


Figure 7. ULAB recycling process flow.

THE IMPACTS OF HAZARDOUS WASTE RECYCLING

ENVIRONMENTAL IMPACTS OF HAZARDOUS WASTE

The treatment of materials containing hazardous substances may result in adverse impacts to the environment and to human health. If recycling operations are not conducted properly and if the appropriate environmental safeguards (such as emission control devices, wastewater treatment, etc.) are not in place then recycling may lead to significant adverse environmental impacts (Kreusch et al., 2007).

Hazardous substances enter the environment through many different routes to enter the air, water, soil, and biota. From these compartments, these substances may enter the human body through inhalation of hazardous vapor, ingestion of contaminated food or water, and through skin absorption of contaminated media (i.e. swimming in contaminated water) or by wearing contaminated clothing (Figure 4).

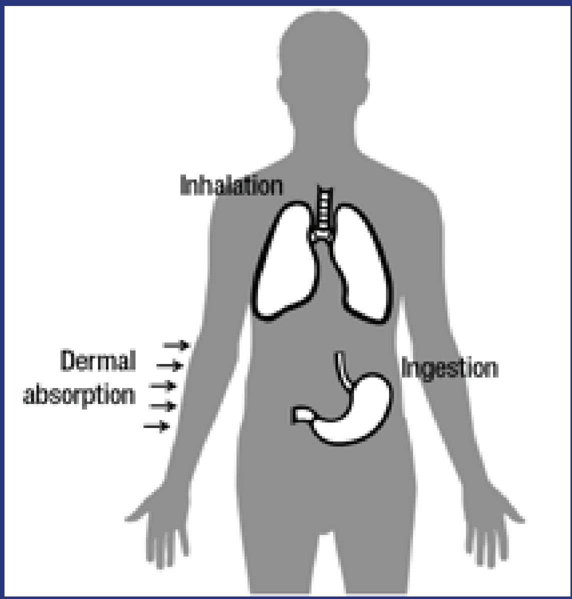


Figure 8. Common routes of exposure to hazardous substances

Impacts on Air. In the process of recycling materials containing hazardous substances, dust containing chemicals of concern, as well as vapor phase toxic chemicals may be released into the atmosphere.

For instance, when CRTs are disassembled in uncontrolled conditions, lead vapor may escape and may contaminate the ambient air.

The physical process of battery breaking may also release lead particulates into the air. For large-scale, regulated facilities, this should not be a cause for concern if the facility is sealed. However, in open areas, this poses a health risk for workers and other nearby personnel. In addition, by products of lead recovery techniques may still contain some percentages of lead. Some of these materials are a challenge to handle, particularly if the system is not automated, because they may be dry and powdery (i.e. dross). If not properly contained, these materials may lead to lead contamination of the air inside the facility.

Particulate matter from battery breaking, combustion of lead containing materials, and other processes may contaminate the surrounding air if filters or other emission control devices are not set in place. In the smelting process for metals recovery in PrCBs and other scraps, sulfur dioxide may also escape if there are no flue gas controls.

In addition, burning plastic materials containing chlorine or brominated flame retardants will result in the formation of dioxins and furans (Figure 5) – which are persistent organic pollutants.

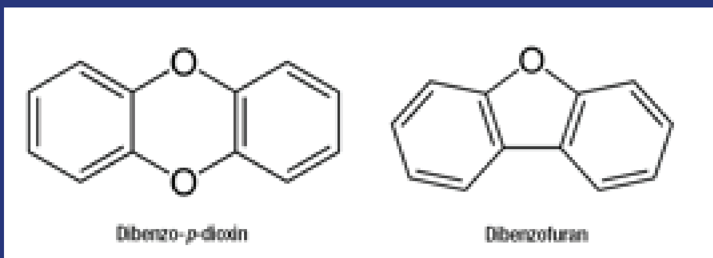


Figure 9. Chemical structure of dioxins and furans (adapted from Altarawneh, et al., 2009)

The Clean Air Act of 1999 (RA 8749) regulates the release of hazardous air pollutants into the atmosphere. Tables 7 and 8 below show the emissions and ambient air standards relevant to the industrial activities.

Table 13. Selected emission standards for source specific air pollutants (RA 8749)

Pollutant	Standard applicable to source limits	Maximum permissible (mg/Ncm)
Antimony and its compounds	Any source	10 as Sb
Arsenic and its compounds	Any source	10 as As
Cadmium and its compounds	Any source	10 as Cd
Copper and its compounds	Any industrial source	100 as Cu
Lead	Any trade, industry or process	10 as Pb
Mercury	Any source	5 as elemental Hg
Nickel and its compounds except Nickel Carbonyl[a]	Any source	20 as Ni

Pollutant	Standard applicable to source	Maximum permissible limits (mg/Ncm)
Particulates	Other stationary sources[b]	200
Sulfur oxides	1. Existing stationary sources[c] 2. New stationary sources[c]	2,000 as SO^3 200 as SO^3
Zinc and its Compounds	Any source	100 as Zn

Notes: (a) Emission limit of nickel carbonyl shall not exceed 0.5 mg/Ncm; (b) Other stationary sources (particulates) means a trade, process, industrial plant, or fuel burning equipment other than thermal power plant, industrial boilers, cement plants, incinerators, smelting furnaces; (c) Other stationary sources (sulfur oxides) refers to existing and new stationary sources other than those caused by the manufacture of sulfuric acid and sulfonation process, fuel burning equipment and incineration.

Table 14. Selected ambient air standards for source specific air pollutants from industrial sources/ operations (RA 8749)

Pollutants	Concentrationa		Averaging time (min)
	mg/Ncm	ppm	
Lead	20		30
Nitrogen Dioxide	375	0.20	30
	260	0.14	60
Sulfur Dioxide	470	0.18	30
	340	0.13	60
Antimony	0.02	--	30
Arsenic	0.02	--	30
Cadmium	0.01	--	30
Sulfuric Acid	0.3	--	30
Nitric Acid	0.4	--	30

Source: Data based from Clean Air Act of 1999 (RA 8749)
Note: (a) Pertinent ambient standards for antimony, arsenic, cadmium, asbestos, nitric acid and sulfuric acid mists in the 1978 NPCC Rules and Regulations may be considered as guides in determining compliance.

Impacts on Water. Hazardous substances released in the course of recycling or treatment may have severed adverse impacts on both surface water and ground water. When heavy metals infiltrate aquatic habitats, there is a large potential for biological uptake. For instance, microorganisms in water bodies contaminated with inorganic mercury may convert the heavy metal into methylmercury – which is known to be the more toxic form. The microorganisms and other phytoplankton absorb the mercury into their tissues where it may bioaccumulate. As these microorganisms or phytoplankton are consumed by animals from the higher trophic levels, the mercury is transferred. As a consequence, organisms belonging to the higher trophic levels have higher concentrations of mercury in their tissues and this amplification is called biomagnification. Lead has already been found in the water and fish of Manila Bay (Sia Su, et al. 2009).

Hazardous substances may also find their way to drinking and irrigation water supplies. Using contaminated water to irrigate agricultural areas will also increase the chances of plant uptake of heavy metals, which may then be subsequently transferred to humans.

Philippine national legislation exists to control the release of toxic substances Philippine water systems. Republic Act (RA) 9275 was passed to protect Philippine water systems from the adverse impacts of industry, commercial establishments, agriculture and the domestic sector. The DENR sets the allowable limits of effluent discharge through DENR Administrative Order 34 and 35. Tables 9 to 10 below show the significant effluent quality parameters and standards relevant to industrial processes.

Table 15. DENR water quality guidelines for secondary parameters-toxic metals[(a,b)] and PCBs (DAO 34 & 35)

Parameter	Water body classification								
	AA	A	B	C	D	SA	SB	SC	SD
Arsenic	0.01	0.01	0.01	0.02	0.04	0.01	0.01	0.02	0.04
Cadmium	0.003	0.003	0.003	0.005	0.01	0.003	0.003	0.005	0.01
Chromium (Cr^{6+})	0.01	0.01	0.01	0.01	0.02	0.05	0.05	0.05	0.1
Copper as dissolved Copper	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.04
Lead	0.01	0.01	0.01	0.05	0.1	0.01	0.01	0.05	0.1
Manganese	0.2	0.2	0.2	0.2	2	0.2	0.2	0.2	2
Mercury	0.001	0.001	0.001	0.002	0.004	0.001	0.001	0.002	0.004
Nickel	0.02	0.02	0.04	0.2	1	0.02	0.04	0.06	0.3
Zinc2	2	2	2	4	0.04	0.05	0.8	1.5	
Polychlorinated Biphenyls[c]	<0.1	<0.1	0.2	0.5	1	0.3	0.3	0.5	1

Notes: (a) Unless otherwise specified, the above parameters are expressed as total metals expressed in mg/L; (b) If the natural level exceeds the guideline, then the natural level concentration prevails provided that the maximum increase in concentration is only up to 10 percent from the natural concentration; (c) expressed as µg/L.

Table 16. Significant effluent quality parameters (DAO 34 & 35)

Industry	Parameter
Non-ferrous smelting and refining, except precious metals	Temp, pH, TSS, Arsenic, Cadmium, Lead, Mercury, Zinc, Copper, Iron, Nickel
Manufacture of electronics and semiconductors including radio, television and communication equipment and apparatus	pH, COD, TSS, Lead, TCE
Recycling of metal waste and scrap	Color, Temp, pH, BOD, COD, TSS, Iron, TCE
Hazardous waste treatment, storage and disposal facilities	Color, Temp, pH, BOD, COD, TSS, Nitrate, Phosphate, and other parameters depending on the nature of their activities

The Department of Health also recognizes the significance of ensuring that drinking water quality is safe for human consumption. Table 11 below presents the standard values for selected inorganic chemicals with health significance, based on the Philippine National Standards for Drinking Water (DOH, 2007).

Table 17. Philippine drinking water standard values for inorganic chemicals (DOH, 2007)

Metal	Maximum Level (mg/L)	Sources/Occurrence
Cadmium	0.003	Cadmium is used in manufacture of steel, plastics and battery and released to the environment through wastewater or fumes. Cadmium is released in water supply as impurity of the zinc coating of galvanized pipes and solders and metal fittings.
Chromium (Total)	0.05	Chromium is widely distributed in the Earth's crust. Occurs in wastewater in certain industries such as chromium plating of bumpers, grills and ornaments.
Lead	0.01	Lead may be present in water primarily from plumbing systems lead pipes, solder, fittings or the service connections to the homes. Although it may be found naturally occurring in certain areas, rarely is it present in water supply as a result of its dissolution from natural sources.
Mercury (Total)	0.001	Mercury is used in industries such as in the electrolytic production of chlorine, in electrical appliances, in dental amalgams and as a raw material for various mercury compounds. Mercury occurs naturally in freshwater and groundwater in the inorganic form. Methylation of inorganic mercury occurs in freshwater and seawater.

Impacts on Soil. Hazardous substances resulting from recycling and treatment activities may contaminate the soil in different ways. For example, in ULAB recycling, should battery breaking and drainage be conducted in an unprotected/unlined area, then the acid can contaminate the soil. An additional complication occurs when the acid drains/evaporates and leaves the lead particles in the soil – once dry the lead particles can be carried by wind or water and transported into other areas. Lead particulates also pose a health hazard to humans in the area. In addition, if battery breaking or drainage is done manually and without the appropriate personal protective equipment, contact with the acid can lead to serious injury.

If the recycling facility is not fully automated, the manual transfer of separated battery components to the furnace or smelter may also result in spillage of lead contaminated liquids. If not properly controlled or managed, this may also lead to soil contamination and to the production of lead particulates after the liquid has drained or evaporated.

Once in the soil, other processes such as rainfall may transport the contaminants (i.e. heavy metals) into both surface water (through runoff) and groundwater (through percolation).

The figure below summarizes the fate of materials containing hazardous substances and the corresponding routes to environmental and human health impacts.

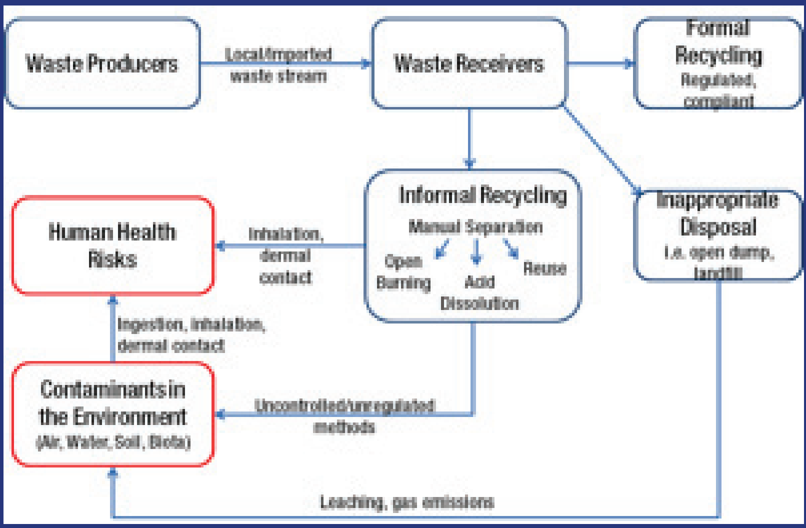


Figure 10. Summarized flow of wastes and its routes leading to environmental and human health impacts.

HEALTH IMPACTS OF HAZARDOUS WASTE SUBSTANCES

Lead. Lead is a very versatile material and is used in many different applications such as the manufacture of paints, ammunition, plumbing materials, alloys, and in the production of lead-acid batteries. As a widely used material, lead is found in all compartments of the biosphere – in the soil, in the air, in the water, and in biota.

In the environment, lead contamination can lead to a wide range of effects such as losses in biodiversity, decreased growth and reproductive rates and neurological effects in vertebrates.

The World Health Organization (WHO) estimates that exposure to lead accounts for 0.6% of the global burden of disease and that 98% of adults and 99% of children suffering from lead exposure are from middle to low income countries (WHO, 2009). Of grave concern are informal or unsafe recycling operations that may expose communities to both acute and chronic lead poisoning (Haefliger, 2009).

Box 1. Guideline Values for Lead (WHO, 2010a)

Medium	Concentration
Drinking Water	10μg/ml
Air (annual ave)	5μg/m³
Blood (males)	40mg/dl
Blood (females)	30 mg/dl

Lead affects the human body in various ways. In general, lead can be ingested by partaking of contaminated water or food, inhaled when lead-coated particulates are present, or absorbed by skin contact. Of these, ingestion is the most significant pathway, followed by inhalation (CDC, 2007). Once in the body, lead may cause a wide range of health problems including neurodevelopmental problems, reduced renal function, hypertension, impaired fertility and in severe lead poisoning cases, mortality.

Infants, children below 5 years of age, and pregnant women are most vulnerable to lead poisoning. Children absorb four to five times as much lead as adults and are especially at risk because at this stage, the blood-brain barrier is not fully developed (WHO, 2009). Once in the body, lead can impair the development of the child's nervous system and may affect his or her intelligence quotient (IQ). This is also of economic concern, as studies have determined that each decrease in IQ points results in productivity losses on a macroeconomic scale. Lead exposure in children in the Philippines is estimated to cost the country 15,019,373,494 USD which corresponds to 3.82% of GDP lost to lead-attributable IQ loss (Attina and Trasande, 2013).

When exposed to high levels of lead, pregnancy may end in miscarriage, stillbirth, premature birth, minor malformations and low birth weight.

Lead exposure studies for the Philippines is not lacking but these predominantly target exposure routes through leaded gasoline and other fossil fuel combustion, paints, and other lead-containing household items (Zhang, et al, 1998; Sharma and Reutergarth, 2000; Riederer, et al, 2005; Riddell, et al., 2007; and Solon, et al., 2008; and Caravanos, et al., 2013).

Among the few published studies on occupational lead exposure include Sulpido and Ong's studies of small-scale battery repair/recycling shop and car radiator repair shop employees/workers (2000). Because these small scale facilities are commonly situated close to the residence, bystander exposure (in children) was also studied. The results of their research showed that none of the adults working in car radiator repair shops had blood lead (PbB) levels above the WHO standard of 40 mg/dl. On the other hand, 72.5% of those employed in battery repair/recycling shops had PbB levels above the WHO permissible limit. In addition, it was also determined that all children exposed to battery recycling/repair activities had PbB levels above the permissible limit, and only one infant had PbB less than 30 mg/dl. These results show that small scale battery repair/recycling shops are a significant source of occupational lead exposure. In addition, because small scale operations are commonly done in the backyard or in close proximity to residences, bystander exposure is also of grave concern, especially for the children in the vicinity.

Mercury. Waste materials that contain mercury include discarded batteries, electronics switches, sensors, and relays, discharge lamps, and medical equipment. In electronic waste, mercury is commonly in its inorganic form – metallic mercury. If waste materials containing metallic mercury are treated or disposed of improperly, the mercury may leach into the environment or may be directly inhaled (as mercury vapor) or absorbed by humans through dermal contact. In the environment, elemental mercury can be metabolized by microorganisms into its organic form – methylmercury. If these microorganisms are ingested by predators, the methylmercury is transferred to the next trophic level and eventually bioaccumulates in higher level predators such a large fish or birds. The presence of mercury has been noted in landfill gas emissions (Lindberg, et al, 2005), attributed to the presence of light bulbs, thermometers, and other electrical wastes mixed in with municipal wastes. In humans, mercury affects the central and peripheral nervous systems – leading to neurological and behavioral disorders such as neuromuscular changes, and problems in cognitive and motor functioning. Mercury also affects the kidneys,

Box 2. Guideline Values for Mercury (WHO, 2007)

Medium	Concentration
Drinking Water	1 μg/L[a]
Air (annual ave)	1 μg/m³
Food	1.6 μg/kg bodyweight per week[b]

[a] as total mercury
[b] as methylmercury, to protect fetus from neurotoxic effects

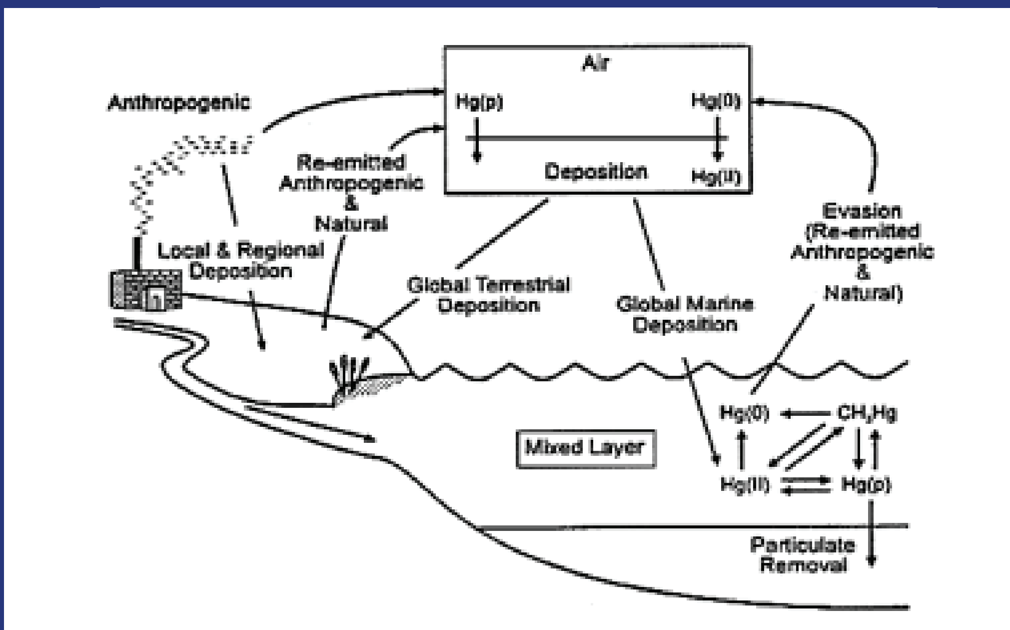


Figure 11. The mercury cycle (Bullock, 1990).

Cadmium. Waste materials that contain Cadmium include batteries, printed circuit boards, cathode ray tubes (as glass coating) and various plastics or polymers. Improper treatment and disposal of Cadmium containing wastes can lead to the spread of Cadmium in the environment.

Box 3. Guideline Values for Cadmium (WHO, 2010b)

Medium	Concentration
Drinking Water	3 µg/L[a]
Air (annual ave)	5 ng/m^3
Food	25 µg/kg bodyweight per week[b]

[a] as total mercury
[b] as methylmercury, to protect fetus from

In the atmosphere, Cadmium may adsorb onto particulate matter and may be transported by wind over long distances. Wet (through rain) or dry (through gravity) deposition can transfer the Cadmium onto the soil, from where it can enter the food chain through plant uptake. Certain plants such as rice and potatoes have a strong affinity for Cadmium and can absorb it more quickly than lead or mercury (Satarug, 2003). Cadmium may also enter the food chain through the use of cadmium contaminated irrigation water for agriculture, or through direct uptake by fish and shellfish.

In humans, the main route of occupational exposure is through inhalation (ATSDR, 2008). Once in the body, Cadmium targets the kidneys – where it may accumulate, leading to the impairment of the renal tubules. This may adversely affect calcium metabolism and in extreme exposure, may lead to softening of the bones and osteoporosis.

Polybrominated Diphenyl Ethers (PBDEs) and Polybrominated Biphenyls (PBBs). Also known as brominated fire retardants, these organic compounds may contain from two to ten bromine atoms (Figure 8), with a possible number of up to 209 congeners. When exposed to high temperatures, these chemicals release bromine radicals which substantially impede combustion and the spread of fire. As such, they are used in many products such as textiles, furniture, electrical equipment, and electronic devices (ATSDR, 2004). These chemicals have no natural sources, and persist in the environment.

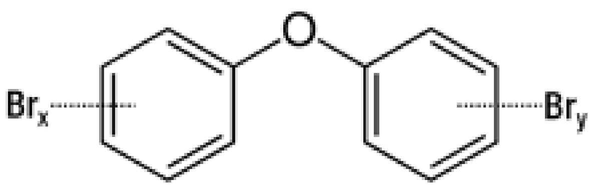


Figure 12. PBDE structure, where x + y may be equal to any quantity between two and ten (adapted from Costa and Giordano, 2007).

PBDEs enter the environment through leaching in waste disposal sites, uncontrolled waste recycling, emissions from manufacturing processes, and through volatilization from products that are treated with brominated flame retardants (Streets, et al., 2006). For example, printed circuit board fiberglass and resins are treated with brominated flame retardants, but these chemicals are not sequestered in the polymer and can leach out.

Because they are persistent, these chemicals may be transported through long distances and are now found in most environments (ATSDR, 2004).

While there is no data yet on PBDE or PBB effects on human health, animal studies suggest that these chemicals can cause reproductive or developmental effects, neurotoxicity, and endocrine disruption (Wu, et al., 2007). The International Agency for Research on Cancer has classified PBBs as reasonably anticipated to be human carcinogens.

In the Philippines, PBDEs have been detected in algae such as *Sargassum oligosystum, Sargassum aff. Bataanense, Padina sp., Jania adhaerens*, which suggests that these plants may be a potential player in PBDE bioaccumulation in the Asia Pacific region (Haraguchi, et al., 2010). Brominated flame retardants have also already been detected in sediment samples from Manila Bay (Isobe, et al., 2010). PBDEs have also already been detected in breast milk samples from mothers living in Payatas and Malate in levels that were much higher than those found in Japan (Malarvannan, 2009). While PBDE sources cannot be ascertained due to lack of studies in PBDE accumulation, the levels found in the samples correspond to levels observed in occupational exposure to electronic dismantling.

CASE STUDY: HEALTH IMPACTS OF ULAB RECYCLING IN BULACAN

In the Philippines, over 100, 000 people are affected by the ULAB industry in one province alone.[109] This is the Province of Bulacan which is considered as the hub of ULAB recycling, as the biggest recycling facility in Asia is located here, together with many other recycling facilities in the Municipality of Meycauayan and the City of Marilao.[110]

A most recent study by Visco, Amparo, Mendoza, Jimena, Lagos, and Dumalanta was conducted to determine the perception of the residents of Meycauayan and Marilao in Bulacan on the effect of lead recycling. Visco, et al. first factored in the residents' socio-demographic characteristics then obtained a sampling of the household for the interview.

[109] Visco, E., Amparo, J., Mendoza, M., Jimena, C., Lagos, D., and Dumalanta, R., Perceived Effects of Lead Recycling to Selected Communities in Bulacan, Philippines, 16 Journal of Environmental Science and Management 56 (2013)

[110] *Ibid.*

The result of the study validated the there are very real adverse health impacts of hazardous waste, or specifically ULABs recycling. Of the 281 respondents from 4,557 households in selected barangays in Meycauayan and Marilao where there are lead recycling activities, the following are illnesses that are perceived to have been brought about by the ULAB recycling:

Table 18. Respondents Perceived health effects of ULAB Recycling

Illnesses*	Frequency (n=281)	Percentage
Cough/colds/fever	200	71
Skin problems/disorder	23	8
Lung problems	70	25
Heart and blood problems	33	8
Dengue	5	2
Diabetes	3	1
Cancer	1	0.3
Asthma	35	12
Dengue	15	5
TB	36	13
Typhoid	2	1
Pneumonia	2	1
Chest pains	32	11
Infertility	10	4
Constipation and vomiting	2	1
Don't know	20	7

CONCLUSIONS

Certainly, hazardous substances from formal and informal recycling operations are already in the Philippine environment and food chain, and while there is still a dearth in epidemiological literature, it already manifested in health issues in exposed Filipino populations.

Waste importation and its regulations are not perfect. The responsibility of determining material functionality (whether reusable/repairable or recyclable) should be clearly delineated. Inspections of cargo and the supply chain of imported materials for treatment or recycling needs to be strictly monitored. While the DENR requires the handlers (transportation, storage, and treatment/disposal) of wastes containing hazardous substances to get accreditation, there is no guarantee that the waste stream is funneled to such companies.

The informal recycling sector cannot be ignored as it is a generator of hazardous contamination and as a significant area of human exposure to hazardous substances. In addition, special attention must be given to such operations in the light of climate change – heavy rain downpour over unprotected work areas may further spread the release of hazardous materials through runoff or percolation.

In addition, imported recyclable materials are not the only issue – locally generated hazardous waste must also be addressed, and waste exportation must also be studied.

The DENR's accreditation of formal recycling activities is based on the premise that these companies comply with existing environmental guidelines. It should be studied whether these guidelines cover all aspects of hazardous wastes that may be generated through recycling activities. For instance, monitoring of persistent organic pollutants resulting from equipment disassembly should be considered. A review of the parameters monitored should also be conducted to make sure that all substances of concern are within safe and acceptable limits. There is still much room for improvement – including the role and capacity of the government to monitor such activities.

The rapid obsolescence of electronic products as well as increase in consumption emphasizes the significance of electronic waste management. Under RA 6969, electronic wastes are classified under miscellaneous waste. Under RA 9003 they are classified as "special wastes" – and the law simply stipulates that they be treated separately from municipal waste. It might be better if specific guidelines on how to dispose, handle and treat such materials existed.

It should also be noted that hazardous waste recycling is but one of the last steps in a hazardous waste management plan. The best option – as in any waste management hierarchy – is to avoid/reduce hazardous waste generation for both the international and local levels. Strategies such as effective programs on sustainable consumption as well as life cycle analyses of electronic wastes may yield significant impacts in electronic waste reduction. Aside from this, proper waste segregation and channeling to accredited/regulated waste handlers must be ensured. At the same time, health care and alternative livelihood programs for backyard/informal recyclers must also be provided to ensure equitable development. The role of electronics manufacturers is also significant in ensuring that electronic wastes are collected and treated properly through Extended Producer Responsibility programs.

In the end, recycling or treatment operations for materials containing hazardous substances is necessary – at the very least to address local waste generation; and accepting imported materials containing hazardous wastes may provide economic benefits (particularly in lead recycling). However, the effective and efficient implementation of safeguards such as adequate pollution control mechanisms, occupational health and safety programs, and strict monitoring of environmental quality as well as supply chain transfer is needed to ensure that environmental and human health impacts are minimized, if not avoided completely.

Finally, a ratification of the Ban Amendment is long overdue. It won't cause adverse economic repercussion as has been feared for so long. The Philippines in present day 2013 is greatly different nation from what it was 24 years ago – it's a country that can more than domestically supply its industries' need for e-waste. Moreover, the country has become a regional hub for lead acid battery recovery such that this material in fact comes from fellow developing countries, and not from the rich, developed countries whose predatory practices the Ban Amendment seeks to eliminate since such would environmental injustice at its core.

The Ban Amendment ought to come into force already, and it's high time for the Philippines to become the pariah of the remaining faction of nations who have fallen on deaf ears to cries for global environmental justice.

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ANNEX

Code	A1 Metal and Metal-Bearing Wastes
A1010	Metal wastes and waste consisting of alloys of any of the following: • Antimony • Arsenic • Beryllium • Cadmium • Lead • Mercury • Selenium • Tellurium • Thallium but excluding such wastes specifically listed on list B.
A1020	Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: • Antimony; antimony compounds • Beryllium; beryllium compounds • Cadmium; cadmium compounds • Lead; lead compounds • Selenium; selenium compounds • Tellurium; tellurium compounds
A1030	Wastes having as constituents or contaminants any of the following: • Arsenic; arsenic compounds • Mercury; mercury compounds • Thallium; thallium compounds
A1040	Wastes having as constituents any of the following: • Metal carbonyls • Hexavalent chromium compounds
A1050	Galvanic sludges
A1060	Waste liquors from the pickling of metals
A1070	Leaching residues from zinc processing, dust and sludges such as jarosite, hematite, etc.
A1080	Waste zinc residues not included on list B, containing lead and cadmium in concentrations sufficient to exhibit Annex III characteristics
A1090	Ashes from the incineration of insulated copper wire
A1100	Dusts and residues from gas cleaning systems of copper smelters
A1110	Spent electrolytic solutions from copper electrorefining and electrowinning operations
A1120	Waste sludges, excluding anode slimes, from electrolyte purification systems in copper electrorefiing and electrowinning operations
A1130	Spent etching solutions containing dissolved copper
A1140	Waste cupric chloride and copper cyanide catalysts
A1150	Precious metal ash from incineration of printed circuit boards not included on list B
A1160	Waste lead-acid batteries, whole or crushed
A1170	Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous
A1180	Waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB- capacitors, or contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on list B B1110)
A1190	Waste metal cables coated or insulated with plastics containing or contaminated with coal tar, PCB11, lead, cadmium, other organohalogen compounds or other Annex I constituents to an extent that they exhibit Annex III characteristics.

Code	A2 Wastes containing principally Inorganic Constituents, which may contain metals and organic materials
A2010	Glass waste from cathode-ray tubes and other activated glasses
A2020	Waste inorganic fluorine compounds in the form of liquids or sludges but excluding such wastes specified on list B
A2030	Waste catalysts but excluding such wastes specified on list B
A2040	Waste gypsum arising from chemical industry processes, when containing Annex I constituents to the extent thatit exhibits an Annex III hazardous characteristic (note the related entry on list B B2080)
A2050	Waste asbestos (dusts and fibres)
A2060	Coal-fired power plant fly-ash containing Annex I substances in concentrations sufficient to exhibit Annex III characteristics (note the related entry on list B B2050)

Code	Wastes containing principally organic constituents, which may contain metals and inorganic materials
A3010	Waste from the production or processing of petroleum coke and bitumen
A3020	Waste mineral oils unfit for their originally intended use
A3030	Wastes that contain, consist of or are contaminated with leaded anti-knock compound sludges
A3040	Waste thermal (heat transfer) fluids
A3050	Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives excluding such wastes specified on list B (note the related entry on list B B4020)
A3060	Waste nitrocellulose
A3070	Waste phenols, phenol compounds including chlorophenol in the form of liquids or sludges
A3080	Waste ethers not including those specified on list B
A3090	Waste leather dust, ash, sludges and flours when containing hexavalent chromium compounds or biocides (note the related entry on list B B3100)
A3100	Waste paring and other waste of leather or of composition leather not suitable for the manufacture of leather articles containing hexavalent chromium compounds or biocides (note the related entry on list B B3090)
A3110	Fellmongery wastes containing hexavalent chromium compounds or biocides or infectious substances (note the related entry on list B B3110)
A3120	Fluff - light fraction from shredding
A3130	Waste organic phosphorous compounds
A3140	Waste non-halogenated organic solvents but excluding such wastes specified on list B
A3150	Waste halogenated organic solvents
A3160	Waste halogenated or unhalogenated non-aqueous distillation residues arising from organic solvent recovery operations
A3170	Wastes arising from the production of aliphatic halogenated hydrocarbons (such as chloromethane, dichloro-ethane, vinyl chloride, vinylidene chloride, allyl chloride and epichlorhydrin)
A3180	Wastes, substances and articles containing, consisting of or contaminated with polychlorinated biphenyl (PCB), poly- chlorinated terphenyl (PCT), polychlorinated naphthalene (PCN) or polybromi nated biphenyl (PBB), or any other polybrominated analogues of these compounds, at a concentration level of 50 mg/kg or more12
A3190	Waste tarry residues (excluding asphalt cements) arising from refining, distillation and any pyrolitic treatment of organic materials
A3200	Bituminous material (asphalt waste) from road construction and maintenance, containing tar (note the related entry onlist B, B2130)

Code	Wastes which may contain either inorganic or organic constituents
A4010	Wastes from the production, preparation and use of pharmaceutical products but excluding such wastes specified on list B
A4020	Clinical and related wastes; that is wastes arising from medical, nursing, dental, veterinary, or similar practices, and wastes generated in hospitals or other facilities during the investigation or treatment of patients, or research projects
A4030	Wastes from the production, formulation and use of biocides and phytopharmaceuticals, including waste pesticides and herbicides which are off-specification, outdated,13 or unfit for their originally intended use
A4040	Wastes from the manufacture, formulation and use of wood-preserving chemicals
A4050	Wastes that contain, consist of or are contaminated with any of the following: • Inorganic cyanides, excepting precious-metal-bearing residues in solid form containing traces of inorganic cyanides • Organic cyanides
A4060	Waste oils/water, hydrocarbons/water mixtures, emulsions
A4070	Wastes from the production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish excluding any such waste specified on list B (note the related entry on list BB4010)
A4080	Wastes of an explosive nature (but excluding such wastes specified on list B)
A4090	Waste acidic or basic solutions, other than those specified in the corresponding entry on list B (note the related entry on list B B2120)
A4100	Wastes from industrial pollution control devices for cleaning of industrial off-gases but excluding such wastes specified on list B
A4110	Wastes that contain, consist of or are contaminated with any of the following: • Any congenor of polychlorinated dibenzo-furan • Any congenor of polychlorinated dibenzo-P-dioxin
A4120	Wastes that contain, consist of or are contaminated with peroxides
A4130	Waste packages and containers containing Annex I substances in concentrations sufficient to exhibit Annex III hazard characteristics
A4140	Waste consisting of or containing off specification or outdated chemicals corresponding to Annex I categories and exhibiting Annex III hazard characteristics
A4150	Waste chemical substances arising from research and development or teaching activities which are not identified and/or are new and whose effects on human health and/or the environment are not known
A4160	Spent activated carbon not included on list B (note the related entry on list B B2060)